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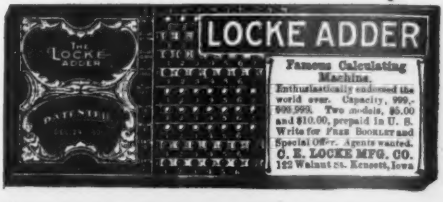
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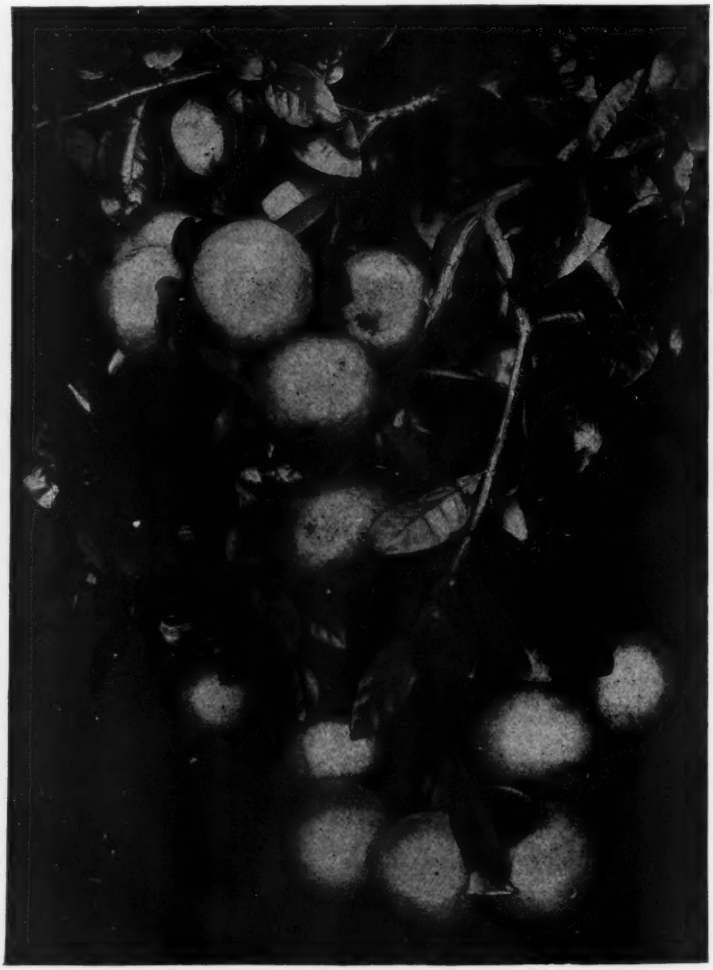

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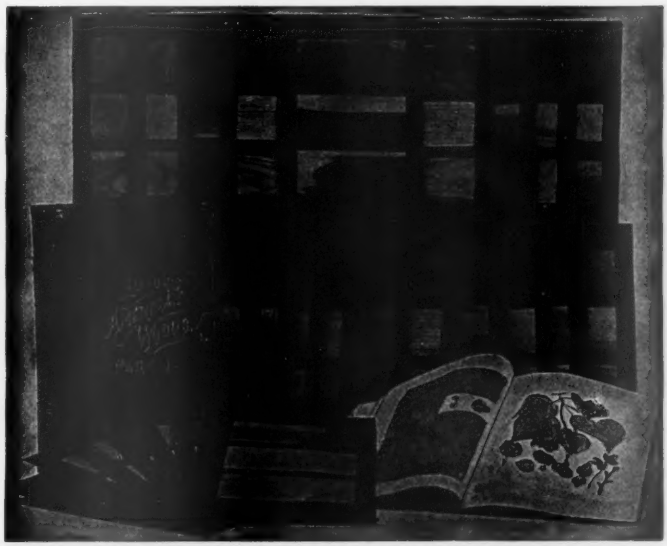

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Forestry and Irrigation

H. M. SUTER, Editor

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A Magnificent Forest of Noble Fir, Hemlock, and Red Fir in Oregon

VOL. XII. AUGUST, 1906. No. 8

NEWS AND NOTES

Conference of Engineers

The Fourth Annual Conference of the Engineers of the U. S. Reclamation Service will be held at Boise, Idaho, September 3 to 8, the Fourteenth Irrigation Congress also being in session at Boise at that time.

This conference is in continuation of the general policy of holding annually a meeting of the principal engineers of the Reclamation Service for the purpose of discussing matters of administration and economies of work. The bringing together of these engineers and prominent citizens of the West make possible an interchange of views and a discussion of data leading to results of very great value in the furtherance of the purposes of the Reclamation Act.

Each of the engineers, experts and specialists in various lines will submit a brief paper embracing some point of general interest, such as detailed methods of cost keeping, of designing, construction, maintenance, or operation. Owing to the advanced condition of many of the irrigation projects now under construction it is expected that this conference will be of more than usual interest and importance.

Reclamation Service Birthday

The U. S. Reclamation Service recently passed its fourth birthday, and that it is a very vigorous infant is shown by a summary of the work accomplished during its brief existence.

Work is now under way on twenty-two projects and 13,000 acres of land have been actually irrigated. Up to July 1st 241 miles of main canal, 116 miles of distributing system, and 388 miles of ditches had been constructed, including dams, headworks, etc. Tunnels having a total length of more than five and one-half miles have been driven, including over two and one-half miles of the great Gunnison tunnel in Colorado. More than 581 miles of telephone lines have been installed and are now in operation; 233 miles of wagon road, many miles of which were cut in solid rock in almost inaccessible canyons, 110 bridges, and 300 office and other buildings have been constructed.

The works above mentioned have called for the excavation of 17,403,213 cubic yards of earth and rock, the laying of 134,446 cubic yards of concrete, 124,901 square yards of rip rap

and paving; 42,947 linear feet of piling have been driven. There have been purchased 1,875 tons of iron and steel, 7,347,312 feet board measure of lumber, and 159,623 barrels of cement. The Government cement mill at Roosevelt, Ariz., erected at a cost of more than $100,000, has turned out 43,0000 barrels of cement, and Uncle Sam's saw mills have cut 2,889,000 feet board measure of lumber from the Government reserves.

Hon. Arthur Hill

In a career of great activity, including many deeds of a public nature, Hon. Arthur Hill, of Michigan, has been a strong factor in the advancement of forestry in the United States, and notably so in his own state of Michigan. As one of the foremost lumbermen of the country, Mr. Hill's experience with the forest began at a very early age. Therefore his efforts for forestry are based upon an unusually strong foundation of practical experience in exploiting forest resources. To his thorough knowledge of the forest needs of his state credit may be given for much of the recent progress made there by the Michigan State Forestry Commission, of which he has long been a member.

Arthur Hill was born 58 years ago at St. Clair, Mich., and among his earlier experiences may be counted sorting and jacking logs and like work in his father's saw-mill. From the Union School he went to the University of Michigan, from which he graduated as a civil engineer. After a short experience in railroad surveying, he spent seven years as a "landlooker," during which time he covered an immense range of country estimating timber. Later he entered the lumber business as a member of Hill Brothers and has ever since been largely identified with the lumber trade. In addition he has also been prominently connected with the steamship business. Being a man of splendid judgment, and a tireless worker his various business enterprises have turned out well. In spite of his many commercial activities Mr. Hill has taken time to broaden himself through travel and and study. Though always a man of high public spirit he has never entered into the role of politician. He has served three terms as mayor of old Saginaw, and is now one of the Regents of the University of Michigan. For some time many of his fellow citizens have urged him to be a candidate for the United States Senate to succeed Gen. Russell A. Alger. His selection for such a place would not only bring to our highest legislative body a strong, practical friend of forestry, but would give the nation the services of a man who has had a long and honorable career in the commercial world, and who could be counted upon as a wise counsellor.

Washington Fire Service

There is significance in the action of Washington timber owners on the forest fire question as shown in the last issue of the Pacific Coast Lumber Trade *Journal,* which, by the way, has been a leader in the movement for fire control. It prints the following item:

"Owners of timber in Washington have subscribed $8,133 for protection from forest fires during the approaching dry season. Of this amount $4,000 was contributed b ythe Weyerhaeuser Timber Company.

"This fund is at the disposal of the state board of forest commissioners and J. R. Welty, the state fire warden. A more practical lot of men for such service would be difficult to find, so the contributors have every assurance that the fund will be wisely expended. The chairman of the state board of forest commissioners is R. W. Condon, of the Puget Mill Company, Port Gamble. Other lumbermen on the board are Joseph Irving, of Everett; Frank H. Lamb, of Hoquiam; and J. A. Veness, of Winlock. E. W. Ross, the state land commissioner, is a member ex-officio. Mr. Welty has had much experience in logging and lumbering,

Courtesy of *American Lumberman*

HON. ARTHUR HILL

A Leader in the Lumber Industry and One of the Foremost Exponents of American Forestry; a Member of the Michigan Forestry Commission

and is well qualified for the responsibility of his position.

"In this connection it may be interesting to know that the fire warden estimates that at one time western Washington contained 239,554,560,000 feet of standing timber, but 42,000,000,000 feet has been destroyed by fire and 30,000,000,000 feet logged off. In other words, the forest fires have destroyed approximately 12,000,000,000 feet more merchantable timber than has been cut for manufacture up to date.

"It is to prevent further destruction of this valuable asset of the State of Washington that successful efforts were made to raise an adequate fund for forest protection this year, in the absence of a State appropriation.

"The board of forest commissioners has decided that the law relative to the use of spark arresters on engines, locomotives, boilers, etc., shall be strictly enforced this year, recognizing that the greatest menace to the forests is the operation of engines not equipped with proper meshing, as required by law. The commissioners, by resolution of August 28, 1905, ordered that the netting of spark arresters used in coal burning engines should be not less than three mesh, No. 12 wire to the inch, and that the netting of spark arresters on wood burning engines should not be less than six mesh No 16 wire, to the square inch.

"Section 10 of chapter 164 of the 1905 laws of Washington amply covers this particular feature, as follows:

" 'Section 10. It shall be unlawful for any person, company or corporation to operate any spark-emitting locomotive, logging or farm, engine or boiler, in this State at any time during the months of June to October, inclusive, or for any person to operate any logging or other engine or boiler in the immediate vicinity of any forest slashing, chopping, wood-land or brush-land during the closed season without such locomotive or engine is provided with and uses a safe and suitable device for arresting sparks. Any person, company or corporation who shall fail to provide and use such spark arresters during the periods herein mentioned shall, upon conviction, pay a fine for each engine or locomotive of each day so operated without such spark arrester of not less than ten or more than fifty dollars, and shall be prohibited from further use of such locomotive and engine in such months or season until such spark arrester is provided and used therewith. * * * Deputy fire wardens and forest rangers shall report any lack of sufficient spark arresters to the prosecuting attorney of their county, and the superior court of that county where suit is first instituted shall have jurisdiction of the offense.'

"Many of the mill companies have asked the commission to appoint their woods foremen forest rangers, to serve without compensation from the State. These men have full authority in the fighting of forest fires in their various districts.

Resolutions on Death of Mrs. Lundy

The following resolutions of condolence were recently adopted by the Pennsylvania Forestry Association; which we take great satisfaction in reprinting here as a slight appreciation of Mrs. Lundy's work for the cause of forestry in this country:

"It is with profound sorrow we record the death on May 8th of our highly esteemed associate and friend, Mrs. J. P. Lundy. Mrs. Lundy was one of the founders of the Pennsylvania Forestry Association in 1886, and has been continuously throughout these twenty years a member of its council and during most of the time corresponding secretary. Her courageous, earnest, untiring and wise devotion to the cause of intelligent forestry, especially in the early years of this movement, when the heroic quality of the pioneer educator in a great and beneficent cause was the essential element of success. Mrs. Lundy was, by her words and deeds, an inspiration and example that won advocates for the cause so dear to her, and we are thankful she was spared to see the

fruits of her labor and effort in the almost universal recognition of and the adoption and application of measures she so ably advocated that are becoming beneficent in results not only to the State but the entire nation.

"*Therefore be it resolved,* That the members of the Pennsylvania Forestry Association hereby express their deep sense of the loss to the cause of forestry, of the wise counsel, the earnest work, the splendid example, the noble exalted life and the true friend that, in the Providence of God, has been taken from us, whose memory will always be cherished by all true lovers of the forest.

"*Be it also further resolved,* That we hereby tender our sincere sympathy to the members of Mrs. Lundy's family in their bereavement.

"*Resolved,* That a copy of this Minute and these Resolutions be sent to the members of Mrs. Lundy's family, to *Forest Leaves, to* FORESTRY AND IRRIGATION, and a copy entered on the records of the Association.

"WM. S. HARVEY,
"MIRA L. DOCK,
"ALBERT LEWIS,

"*Committee on Resolutions of Condolence.*"

Michigan Fire Losses

According to a report compiled by Harry H. Ryerse, chief fire warden of the State, there was destroyed by forest fires in Michigan during May property to the value of $359,357, with the loss in Dickinson County, where considerable havoc was done, as yet unestimated.

The greatest loss occurred in Luce County, where the damage amounted to $101,380. In Presque Isle County damage amounting to $75,075 was done, and in Marquette $41,775. Ontonagon suffered to the extent of $5,525, Baraga $2,300 and Iron $1,000.

The fire warden reported 160 separate and distinct fires during May. The expense of his department in fighting the flames was $867.50.

Progress of Reclamation Work

Mr. C. E. Grunsky, consulting engineer of the Reclamation Service, has just returned to Washington from an extended trip of several months duration to the irrigation projects of the West. He has participated in important conferences of consulting engineers, where advice was necessary in the conduct of the work, or plans were under consideration to solve engineering and other problems which are constantly arising as each project advances from its preliminary stage, when its feasibility is to be determined, to the final stage of actual delivery of water upon the land.

Mr. Grunsky talks with great condence of the ultimate success of the work which Congress has inaugurated, and is a firm believer in its further extension. Projects of a magnitude far beyond the reach of the present reclamation fund will no doubt in time be authorized. In the meanwhile every effort is being put forth by the Reclamation Service all along the line to advance the work in hand and to be able at an early date to show satisfactory results. The difficulties as they arise, many of them being other than the obstacles interposed by nature, are bing met on every hand with a determination to win out, and it is with much satisfaction that an able handling of these as well as of the ordinary engineering problems may be noted.

The general prosperity of the country is having its effect upon the cost of the work. Labor is difficult to obtain in desired amount, and the price of materials required has considerably advanced since the work of the service was commenced. In consequence of these conditions the cost of irrigation will be higher than it would have been with works constructed some years ago. But this is offset by a corresponding increase in value of the products of the irrigated farm, and is no occasion for alarm. These conditions have no doubt in some measure contributed to some of the recent failures of contracting firms on irrigation work. Where such failures have oc-

curred the engineers in charge have proven themselves well qualified to carry on the work by force account, and there is every prospect that results will be highly satisfactory when compared with prices originally bid state Canal on the North Platte River in Wyoming and Nebraska, from which , by the aid of some temporary structures, water has been available since May 5th.

Referring to the situation on the Lower Colorado River, he states that the entire river (about 20,000 second feet) is now flowing into the Salton Sea, instead of into the Gulf of California, where is belongs, and adds that the Southern Racific Railroad company, which has come to the aid of the canal company, is putting forth great efforts to turn the river back into the channel leading to the gulf. The railroad company has completed a spur track from El Rio at Pilot Knob, southerly into Mexico, and is prepared to push the work on the closure of the present channel with the utmost vigor.

Irrigation in Shoshone Reservation

There are several sources of large water supply in the ceded portion of the Shoshone Indian Reservation, Wyo., which was thrown open for settlement on August 15.

The ceded portion of the Shoshone Indian Reservation is the area lying north of Wind River and east of Popo Agie and Bighorn rivers. It lies in the northern central portion of Fremont County, Wyo., and includes also a small corner of Bighorn County, adjoining Bighorn Canyon south of Thermopolis. The total area is about 2,000 square miles. The northern third of this area lies in the Owl Creek and Shoshone mountains and the southern portion comprises a wide region of when such work was offered for contract.

Among the projects that have been advanced to the point of delivering water Mr. Grunsky reports the Interrolling plains in the Wind River basin. The area is bordered on the south by Wind River and its eastern margin is crossed by Bighorn River. These streams carry a large volume of water and flow in flat-bottomed valleys, along which there is a moderate acreage of land that is immediately valuable for agriculture.

With a mean average rainfall of about 13 inches a year, the climate is too arid for the raising of crops without irrigation, but a large amount of water in the two principal rivers is available for this use. Along the bottom lands bordering the rivers the water can be taken out in small ditches, though, owing to the spring floods, there will be difficulty in maintaining these ditches and especially their headgates, and the amount of land that can be irrigated by this means is small. By the construction of irrigation canals, however, wide areas of the basin land could be brought under cultivation, especially if the flood waters of the mountain slopes were stored for use during the dry season. The greater part of the region is well adapted for grazing and this undoubtedly will be its principal use. Fully two-thirds of the land bears a fair growth of nutritious grasses, and water for stock is within reach, except in a few districts.

The only settlers now in the ceded area are a few Indians and white men who have married squaws. The ranches of these people are widely scattered along the rivers and on the creeks near the foot of the mountains.

NOTES ON THE BENGUET PINE

Interesting Description of One of the Two Pines Indigenous to the Philippines

BY

WILLIAM M. MAULE
Forester, Philippine Bureau of Forestry.

EARLY BOTANISTS recognized several species of pines indigenous to the Philippines, but, so far as known at present, we have only two representatives, viz: *Pinus insularis* and *Pinus merkusii*. Of these two species the former is by far the more abundant and widely distributed and is now counted among our commercial woods.

Pinus insularis, because of its abundance and use in Benguet Province, has come to be known as "Benguet pine." Its habitat is restricted to the higher mountain region, at elevations rarely less than 1,600 feet above the sea, in the provinces of Benguet, Lepanto-Bontoc, Abra, and Nueva Viscaya, where, owing to topography and to local conditions, the stands are irregular, both in density and in outline.

Again we find it localized within a small area on Mt. Iba, in central Zambales, which is probably its southern limit.

In northern Zambales, on the upper slopes of the same Cordillera, *Pinus merkusii* covers an area of about 1,000 acres and is not known to occur elsewhere in the archipelago. The latter species, aside from the simple fact of its occurrence, is otherwise interesting from its having been reserved during the Spanish regime, when it was known as the "Kings' pine" (Los pinos del Rey). Notwithstanding this decree, they were utilized to a small extent in the manufacture of naval stores.

The restricted manner in which the pines occur is no doubt due to altitude, with the acompanying high temperatures. The best stands are those occupying the protected valleys and slopes where the soil is deeper and trees are less exposed to strong winds. On such sites the stands are more compact, with greater clear length. On the ridges and elsewhere in exposed positions the stands partake of a more open character, with trees of low spreading crowns and short, heavy boles.

The soil is a uniform reddish clay loam, and, owing to the constant moisture attendant to high altitudes, rarely becomes dry. Surface rocks are not abundant except in certain areas where they outcrop as a result of former volcanic action. A portion of these are hard and resist erosion well, but the greater amount are of a soft character and yield readily to atmospheric action.

In the zone where the pine attains its best development, pure stands are the rule, with a sprinkling of tree ferns and small broad-leaf trees along the streams.

On descending the slopes below an altitude of 1,800 feet, a gradual transition is apparent; the stands become more open and irregular, with at first a sparse mixture of broad-leaf species, and, finally, at about 1,500 feet, the pine disappears.

FORM.

The different forms which the pine assumes on various sites makes it difficult to recognize the typical tree. Under most favorable conditions of soil and situation, and where fires have not entered, one finds stands growing in almost as close order as is characteristic of the white pine (*Pinus stro-*

bus). When growing in close order, the stems are long, straight and fairly cylindrical, with but little root swelling, often free of branches for more than fifty feet.

The species is less tolerant than the white pine and mature stands having grown in open order rarely have clear lengths exceeding two-thirds the tree height. The taper in the clear length is very gradual, but decreases in diameter rapidly in the crown. The maximum diameter is attained in the shorter boled trees where the stand is more open, but rarely exceeds 56 inches at breast high.

Typical Benguet Pine (*Pinus insularis*)

Two types of bark are readily discernible, seemingly irrespective of health or age—the one decidedly polygonal scaled, as of *Pinus ponderosa;* the other vertically, furrowed similar to *Pinus strobus.*

The Benguet pine, being decidedly intolerant, forms an open spreading crown, with needled branches well towards the interior and consequently receives a great amount of light. From the seedling stage, its light-demanding nature is apparent, and reproduction is rarely effected under shade. It is a rapid grower and abundant and regular seeder, being well adapted to the locality. From this fact we may infer that had it not been subjected since remote times to injury from fire, we would find to-day a vast unbroken forest, of close order, covering the natural range of the species.

The following table, showing diameter growth, was derived from a series of stump analyses. While we cannot be sure (owing to the irregularity of seasonal growth in tropical species) that each ring represents a year's growth, yet we know that at least one ring is formed annually, and the age in relation to diameter, therefore, is not underestimated.

DIAMETER, BREAST HIGH.

Inches.	Years.
15	37
16	38
17	39
18	40
19	42
20	43
21	45
22	47
23	48
24	50
25	52
26	54
27	57
28	60
29	64
30	72
31	82
32	95
33	120
34	145

A Stand of *Pinus merkusii*, Zambales

FIRES.

The pine region is the natural haunt of the Igorote, who leads a semi-nomadic life, depending largely for his existence on the chase, and not infrequently owning horses and cattle. In order to secure better pastures or to facilitate hunting, it has been his custom to yearly set fires in the open grass lands. These fires do not confine themselves, however, to the grass areas, but spread through the semi-open into the forest, each year claiming additional open space.

The open and burned over areas are most favorable to natural seeding of pine, and where fires have not recently occurred we find excellent reproduction. If four or five years pass without burning, or when the reproduction has reached a height of two or three feet, the critical stage seems to have passed. This is due to the close formation having crowded out the rank grass which is ever a menace to reproduction. It happens, in cases, that seeding has been poorly effected, leaving the reproduction to grow in open order and consequently exposing it to danger from fire. In the event of fire in the latter case, where the trees have reached a height of three to four feet, a certain portion usually recover. Counts made on such areas show the proportion which survive to average 25 per cent. In the seedling and stages immediately following, the trees can offer no resistance and fires are totally destructive.

LUMBERING.

During February, 1903, a Government reserve was created, which includes forest lands in the vicinity of Baguio, and lumbering thereon—except for Government needs—was prohibited.

More than two years ago the Benguet Commercial Company installed logging and sawing machinery near Baguio. The plant consists of a portable engine 25-horsepower, which drives a 50-inch circular saw. The maximum capacity of the mill is 3,000 feet, board measure, although the cut averages about 2,000 feet per day.

As accessories are planer and shingle mill, which are operated alternately with the saw mill.

Skidding is done by means of a drum and steel cable, driven by a 12-horsepower engine.

American foremen direct the sawing, planing, and shingle making, assisted by a crew of fifteen natives.

The advantage of a steam skidder over the use of carabaos is at once apparent, and is the only means by which many of the steeper slopes can be lumbered profitably.

The lumber finds a ready market in general construction work about the summer capital, and, in order to meet demands at present, the mill is kept running day and night. The logs are remarkably free from defects, such as heart rot, but the boards warp considerably when not properly piled. As a rule, the lumber is very resinous, but occasional pieces are as clear and free of resin as an average grade of white pine.

The stumpage price, which is the Government charge, represents $1.20 per thousand, board measure, while the average selling price is $50. The number of merchantable trees per acre will average from eighteen to twenty, from which nine or ten are selected for felling. Allowing an average of 90 cubic feet of merchantable timber per tree, we have for the stand, per acre, 1,710 cubic feet. Stands of considerable extent are found, however, which will yield four or five times the above amount. There is no doubt but a severer selection would be more favorable to reproduction, but would destroy the esthetic, which it is important to retain for those who would enjoy the summer resort.

SUPERVISION.

With the beginning of lumbering about Baguio, the Bureau of Forestry installed a system of management, which has been largely protective. During the critical season of fires, or February, March, April, and May, a force of native fire wardens is employed, each warden being assigned a section—if possible, the locality in which he resides. Trees are selected for felling by the forestry officer, who resides permanently at Baguio.

In general, fires have been appreciably checked and lumbering regulated and carried on in a conservative manner. The Igorote, who is responsible for the greater number of fires, has been found to be the most satis-

View Showing Character of Bark of *Pinus merkusii*

factory man in fighting them, using as weapons only pine switches. In case the fires have made too great headway the Insular police are called upon to assist. The many roads and trails leading out from Baguio serve well the purpose of fire lines, and, except in the event of very strong winds,

Surface Fire in Open Pine Stand, Consuming Grass Cover

are effective in localizing them. Still other aids are the stretches of sod or earthern fences which the natives have built around their plantation to protect their crops from wild hogs and deer. These enclosures are occasionally abandoned and are commonly encountered in the open land.

Yarded Logs Near a Saw Mill

UNCLE SAM, AUCTIONEER

How the Government will Assist in the Development of a Desert Area

A RATHER UNIQUE scheduled event is to take place in southern Idaho by the time this number of FORESTRY AND IRRIGATION reaches its readers, when Uncle Sam will offer for sale the lots contained in two town sites situated in the heart of the Minidoka irrigation project.

This project provides for the reclamation of about 130,000 acres lying on both sides of Snake River. The land was all public domain and when the engineers designed the system they did not neglect the splendid opportunity for establishing an ideal farming community. Three town sites were laid out in the center of the tract on the proposed line of the Oregon Short Line railway; the towns were platted with wide streets and boulevards, and parks and extensive areas for public buildings were reserved. All the agricultural lands were cut into farms of 40 and 80 acres, so that the instant the tract is brought under cultivation it will become one of the most densely populated agricultural communities in the country. Its prosperity is assured by the unfailing water supply which will be furnished by the big Government canals and ditches, and this prosperity will be reflected in the future success and substantial growth of the towns which Uncle Sam proposes to establish there.

Two years ago the Minidoka country was an uninhabited sage brush plain. The railroad was miles away and it seemed destined forever to serve only as a haunt of the jack rabbit and the skulking coyote. Far below the surface the Snake River cut its way through a canyon across the plain, offering no opportunity for the pioneer with his simple ditch to lead the water out upon the thirsty soil. Only skilled engineers backed by vast capital could tackle such a proposition as this. Many men without the necessary money had looked at it, but its great cost had forced them to give it up. With the passage of the Reclamation Act on June 17, 1902, one of these engineers who had joined the Government force rushed a field party to this point and in a single season prepared and presented a set of plans for a comprehensive system of irrigation. They were accepted and bids were asked and contract awarded for construction.

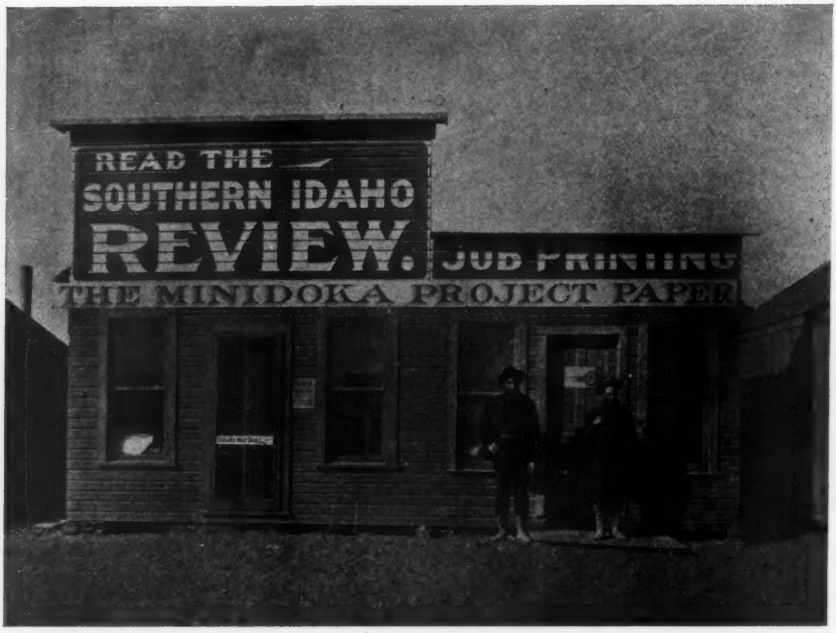
To irrigate this broad expanse of plain the Snake River must be lifted from its bed, and a dam was laid across the stream at Minidoka Rapids, a great rock fill structure 50 feet in height and 650 feet long on top, which raised the water surface 47 feet at flood level and backed it up for thirty-five miles. The dam is near completion and will cost nearly half a million dollars. When the immense gates in the diversion channel are lifted the water will pass into the high line canals on both sides of the river and be led from them through hundreds of miles of laterals to every farm in the valley.

The initiation of this work was followed by an influx of settlers from all over the country, and soon every farm division had been filed upon. While the Government proceeded with the construction of the dam and canal system, the settlers were busily engaged upon their own buildings. The coming of large numbers of farmers created a market and stores sprang up.

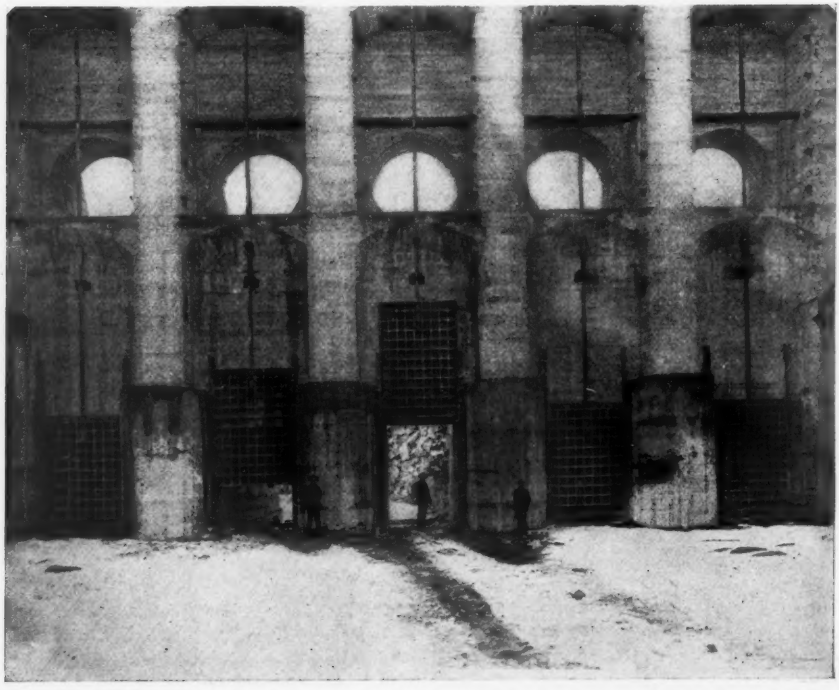
Reypourn, Idaho, Looking Southwest

Main Street in Rupert, Idaho. A Thriving Town Made Possible by Government Irrigation Work

Heyburn, Idaho, Looking Southwest



A Chicago Reporter's Publishing House at Heyburn, Idaho



View Showing the Regulating Gates o the Minidoka Project, Idaho

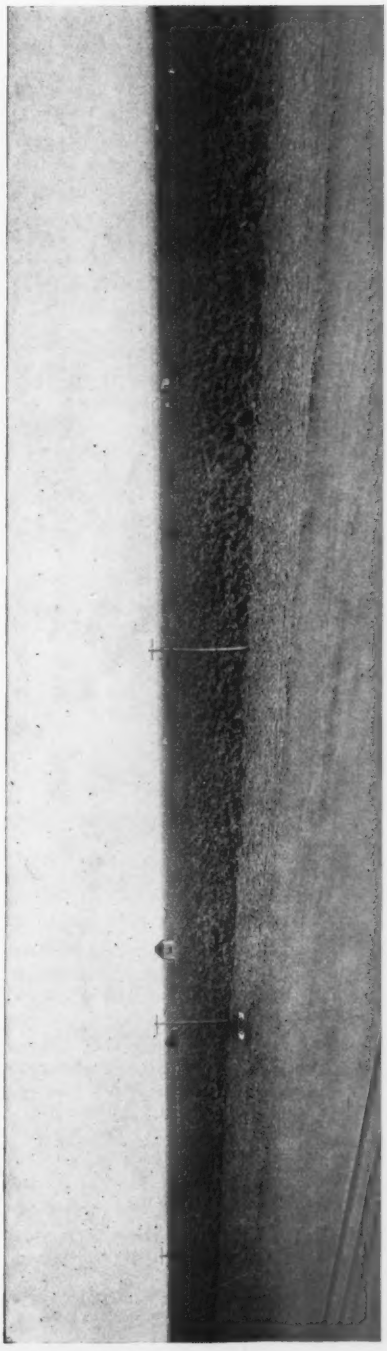
An enterprising young man established a newspaper and as if by magic doctors, lawyers, and mechanics of all classes flocked in. The intoxication of creation was in the air. Other newspapers were started, three banks were established, a school was opened and 70 pupils greeted the teacher the first morning. Meanwhile two lines of steel like ribbons came creeping over the plain, crossed and passed the town sites, and the shriek of the locomotive was added to the creaking of the derricks as great blocks of stone were dropped into place on the dam.

To-day a population of over 4,000 await the completion of the canals and ditches. Scattered here anl there in and around the town sites are 122 mercantile institutions waiting for the town lot sale so that they can move over upon their own property and no longer remain tenants by sufferance of the Government.

Idaho is famous for its irrigated fruits and fields. The soil and climate are adapted to a wide variety of crops. Owing to the importance of the live stock industry in this section alfalfa and other forage crops will always find a profitable market, and all the vegetables and fruits of the north temperate zone may be grown here.

With all these manifold advantages a prosperous future and rapid growth are assured for the new towns. The lots in Sherrer will be reserved for future sale. An important feature in connection with the construction of the irrigation system is the possibility of power development at the dam. This power can be transmitted economically to the towns and utilized for municipal and other purposes.

The optimism of the settlers on the Minidoka project has gone abroad through the enterprising little newspapers which have grown and flourished on the sage brush desert, and before another month is past hundreds of tenderfeet will "hit the trail" for this land of opportunity.



The Sort of Land that is to be Reclaimed in the Vicinity of Rupert, Idaho

THE CHESTNUT (Castanea dentata)*

IX.—Notes on Forest Trees Suitable for Planting in the United States

THE CHESTNUT is distributed throughout the eastern United States at elevations varying from sea level in Massachusetts to 4,500 feet in North Carolina. It ranges from southern Maine southward through New England, being most abundant in the lower valleys of the Merrimac and Connecticut rivers, but common in Rhode Island and Connecticut and as far south as Delaware, except near the sea. It is common in the Province of Ontario in the Middle States, especially in New Jersey, Pennsylvania, and parts of Maryland. Farther south it is found all along the higher Alleghenies to Alabama, growing well in all soils above 2,000 feet elevation, but less abundant below. In the middle West it is confined to Michigan, Indiana, and Tennessee.

The area for economic planting outside of the natural range is rather limited. The tree can be grown with fair success throughout Missouri and Iowa, in the eastern counties of Nebraska and Kansas, and in the southern half of Minnesota, but nowhere on prairie soil is it long-lived or of first-class growth. In Colorado it grows well under irrigation, and would probably succeed in other parts of the West if well watered. If carried too far north the shoots fail to ripen before they are nipped by the early frosts. The tree will endure the heat and cold of its natural home, and will remain thrifty in sunny, dry situations, but is very susceptible to injury from hot winds.

SOIL, SITE, AND ASSOCIATE SPECIES.

The chestnut will thrive on various kinds of soil from almost pure sand to coarse gravel, shale, or even limestone. On the latter, however, it is found only when the strata are tilted. In general it prefers the dry, rocky land of the glacial drift to the richer, more compact alluvial soil of the lowlands. It does not demand a rich soil. Its failure to grow in most of the prairie country is due, no doubt, to the alluvial nature of the soil and the frequent presence of lime.

The finest chestnut trees grow in the higher elevations of the southern Appalachians in western North Carolina and eastern Tennessee, where specimens 13 feet in diameter and 120 feet tall have been found. In this region the tree's greatest development is reached in deep hollows at an altitude of about 3,000 feet. It is here found in mixture with the white, scarlet, and black oaks, ash, hickories, tulip-tree, and other hardwoods. In the North the tree is likewise found associated with many of the hardwoods, especially the oaks and maples, but is generally of smaller size than in the South, the average being a height of 60 to 80 feet and a diameter of 3 to 6 feet. In southern New England it is often found in mixture with white pine, with which it may often be grown in plantations. Throughout its range the chestnut enters largely into the composition of most second-growth hardwood forests. Near the northern and western limits of its range the tree, besides being smaller in size, sprounts less freely from the stump. The region where planting or systematic management will pay is about the same as the natural range of the tree, or may be extended to a limited distance beyond that range. In the Northeastern States the tree may be depended upon to thrive almost anywhere south of the forty-fourth parallel of latitude in the soils which are suited to it.

*Data furnished by U. S. Forest Service.

Group of Chestnut Trees on a Maryland Farm Grown from Nuts Planted in 1822.
The Large Tree on the Left is 36 inches in Diameter

MANNER OF OCCURRENCE—CHARACTERISTICS OF GROWTH.

Within the limits of its range the chestnut occurs either singly or in scattered groups or groves, usually most abundant on the high, gravelly, well-drained hillsides and ridges, and seldom in pure stands.

Chestnuts grown in the forest vary greatly in general form and habits from those grown in parks, pastures, and other open places. The forest tree soon loses its lower branches and develops a tall, tapering trunk, adapted for telegraph poles, ties, and for general use as lumber. But when grown in the open and given plenty of room, it develops a broad, spreading crown, and short, thick trunk.

The chestnut's rate of growth is the most rapid of any of our truly valuable hardwood trees. Seedlings usually attain a height of 10 to 15 inches the first year and continue growing at the rate of 15 to 20 inches per annum for twenty to thirty years. Sprouts grow even more rapidly than this, often attaining a height of 4 to 6 feet the first year, and in twenty to twenty-five years make timber large enough for ties and poles. After thirty years, however, the rapid growth ceases. In New Jersey a chestnut is recorded which had a diameter of 60 inches when 70 years old. In the same State several trees 35 years old ranged from 24 up to 34 inches in diameter, with a height of 40 to 50 feet. The average rate of growth is, of course, far less than the above. It varies according to the nature of the soil, the thinner soils being less favorable to rapid growth than rich upland soil.

The root system spreads out extensively, but no deep tap root is developed. This makes transplanting less difficult than with many other nut-bearing trees. The chestnut is rather intolerant of shade.

THE WOOD—ITS ECONOMIC USES.

The wood is light, rather soft, coarse-grained, and inflexible, the sapwood white, the heartwood darker brown. The wood shrinks and checks considerably in drying, splits and works easily, and because of the tannic acid it contains is very durable in contact with the soil. It is used in cabinet work, cooperage, for interior finishing, fence posts, telegraph poles, and cross-ties. About 5 per cent of the railroad ties in the United States are of chestnut. The original chestnut forests have everywhere been cut, except in parts of the Southern Appalachians, but the reproduction of the coppice is so rapid that a fair supply of small-sized timber is still available.

PROPAGATION.

Chestnut reproduces easily both by seeds and stump sprouts. Nuts are borne nearly every year and a full crop occurs usually every other year, thus keeping the ground well seeded. The nuts that are spread by the squirrels germinate readily and, if there are enough of them, quickly reclothe the ground with seedlings. They grow, however, only in pasture land and open woods, since they can not tolerate dense shade. Their growth may be encouraged by leaving seed trees, protecting the nuts from chipmunks and squirrels, and breaking the ground where the nuts fall.

By far the more common and rapid means of chestnut reproduction is by the coppice sprouts which spring from the newly cut stumps. While not so long lived nor so sound as seedling trees, the coppice sprouts should be encouraged because of their rapid growth and ease of propagation. A clear cutting of chestnut forest in the fall or winter when the trees are dormant, taking care to leave smooth stumps, is all that is needed to insure a future growth. In the Middle and New England States a clear cutting system with a rotation of twenty-five to thirty years gives the best results, and will in that time produce trees large enough for fuel, ties, or posts. A stump will retain the power of sprouting with almost undiminished vigor through several rotations. By starting a small number of seedling

trees of the same or other species among the chestnut coppice and allowing them to live through two or three rotations of the sprouts, large timber trees may be secured. The chestnut is admirably adapted to several systems of forest management.

For commercial or ornamental planting either nursery culture or direct field planting may be practiced. In either case the nuts should be gathered when mature in the fall and stratified in moist sand through the winter, care being taken that they do not dry out after ripening, or become moldy in the sand. If placed in single layers between alternate layers of moist sand in a strong box, out of doors in a sheltered place, they may be depended upon to winter safely.

If started in the nursery the rows should be 3 feet apart, and the nuts placed 1 foot apart in the row and covered 1 to 2 inches, and may be set in the plantation in the spring when either 1 or 2 years old. If transplanted several times in the nursery the plants are improved, but this is usually too expensive to be practiced in economic planting.

For extensive operations direct placing of the nuts in their permanent location is cheapest and best. Fall planting is advised if the planted nuts can be protected from mice and squirrels. Holes should be dug and 2 or 3 nuts placed in each and covered about 2 inches deep, and the dirt packed down quite firmly. The holes should be dug 5 to 6 feet apart. The chestnut will thrive in pure stands, but can be grown to better advantage in mixtures. It is especially adapted for planting with the white and red pine on waste land in New England, and can also be combined with the oaks, ash, and maples.

ENEMIES.

The chestnut as a forest tree is as a rule little troubled by insets or fungi. Several forms of borers work in the wood and under the bark, and their ravages are sometimes extensive. The nuts are attacked by the larvæ of two or more species of weevil, but to the timber grower this is not serious. In case insects of any kind appear in alarming numbers, specimens, accompanied by a detailed account of their appearance and habits as far as determined, should be sent to the Division of Entomology of the Department of Agriculture for identification and suggestions as to their control. The trunks of the young trees in warm situations are often affected by a body blight, or sun scald, as it is called. The bark cracks and loosens on the south and west sides of the tree, and the affected portion finally dies. The extent of injury from this source is, however, not great. new disease of unknown cause has been doing considerable injury during the past ten or fifteen years.

POSSIBILITIES AND USES.

For protective and commercial forest planting few eastern trees are deserving of greater commendation than the chestnut. Among our long-lived hardwood trees it is difficult to find its equal in rapidity of growth and ease of propagation on soils which are good or medium in quality. It is amenable to various systems of forest management, forms a vigorous coppice, yields a wood which is valuable for a variety of uses, and produces a very valuable nut.

The tree grows so extensively in the East that almost no planting has been done except for ornament and for the production of the nuts. In the West little chestnut planting has been done because it is popularly believed that the tree does not generally thrive west of the Mississippi, but in Kansas, Nebraska, and Missouri the few trees that have been started are doinw well.

PLANTATIONS.

Mr. L. A. Goodman, of Kansas City, Mo., has two rows of chestnut trees on his estate in Westport. They

were twice transplanted before set out, were well cared for, and when 20 years old were 40 feet high, with a spread of 28 feet.

At Farlington, Kans., chestnuts were set out with black cherry, black locust, black walnut, and a few catalpas, 4 feet apart each way. They were set in 1882, and in 1895 were 3 inches in diameter breast high and 28 feet high, and free from live branches for 10 or 15 feet.

SHIFTING FORESTS

Thousands of Trees and Shrubs Transplanted on the Grounds of the Jamestown Exposition

IN THE WORK of beautifying the grounds of the Jamestown Exposition, near Norfolk, Virginia, many thousand trees and shrubs have been transplanted. Some of them were brought from long distances and carefully transplanted along the walks and drives of the exposition grounds. The work was done under the direction of Warren H. Manning, the well known landscape designer, and Charles H. Pratt, superintendent of the grounds.

Concerning the transplanting of trees and the attention they require, Mr. Manning said:

"Watching, mulching, watering, trimming, fertilizing is the order of the day now on the Exposition grounds. The trees and shrubs are being closely watched to note their behavior after the shock of removal. The removal of a plant means a loss of roots and a change in conditions that requires, especially in the larger trees, a large stock of vitality to secure a safe recovery. First, the roots that help to pump the water from the ground to the leaves to supply the loss from evaporation must get to work promptly; some trees are dead because the drainage was not good enough to take the standing water out of the holes, and the tree roots were drowned, as they surely will be if the roots are completely submerged in water for a long time. Others, we know, died because a sudden freeze following a rain-storm caught the roots before sufficient top soil could be secured to cover them completely.

"Some of the cedars, as they were being rafted across the waters of the marsh, were caught in a sudden squall, and their roots were given an involuntary salt water bath; these trees seem to lack sufficient vitality to make a good recovery, or perhaps their roots were cut too short.

"With all the adverse circumstances that must come to trees moved for miles in all weather over all sorts of roads, and planted in soil only recently drained, the loss in the fifteen hundred big trees promises to be below the average of the first year of such planting. The loss in the shrubs is, with very few exceptions, much below the average. Some of the finest kinds, like the evergreen, wild myrtle, the wild roses, flowering dogwood and mountain laurel are almost all alive and growing vigorously.

"Mulching, that is covering the surface over the roots, helps newly-planted shrubs to gain a foothold, because it keeps an even condition of temperature and moisture at the roots. We are using coarse manure, grass and leaves for this purpose. The manure supply, always an important consideration, is here secured by supplying the contractors with bedding for their horses with the understanding that they allow the manure to be used on the plantation. Thus grass that must be cut, and would otherwise be useless is made to bring a return, just as a return of fertilizer is secured from the ashes of the brush and wood that is burned in the clearing operations.

"Where trees and shrubs are growing vigorously little or no water is required, but where they are starting slowly, then the ground about the roots is well water soaked about once a week in dry weather. About the tree holes are punched to the depth of the roots, and these holes are repeatedly filled in succession until the ground is soaked. A light daily sprinkling is often worse than useless, as it causes the surface to bake hard—a condition more favorable to rapid evaporation of moisture than is a mluched or loosely dug surface.

"Trees and shrubs were either not trimmed at all or the tops were reduced by removal of whole branches instead of by cutting off the ends of branches and leaving unsightly stubs. The plants were thus not mutilated in appearance, and where well rooted and vigorous started at once into good growth, as have most of the shrubs. The trees are more closely watched, and where they show a tendency to start into more vigorous growth part the way down the branch they are trimmed back to this point.

"Insect enemies must also be watched for, as they are likely to spread rapidly and do serious injury, so an equipment for spraying must be ready at hand for such an emergency. Raising trees and shrubs, like raising children, require constant care."

THE GUNNISON TUNNEL

Good Progress Being Made on One of the Most Difficult of the Government Projects

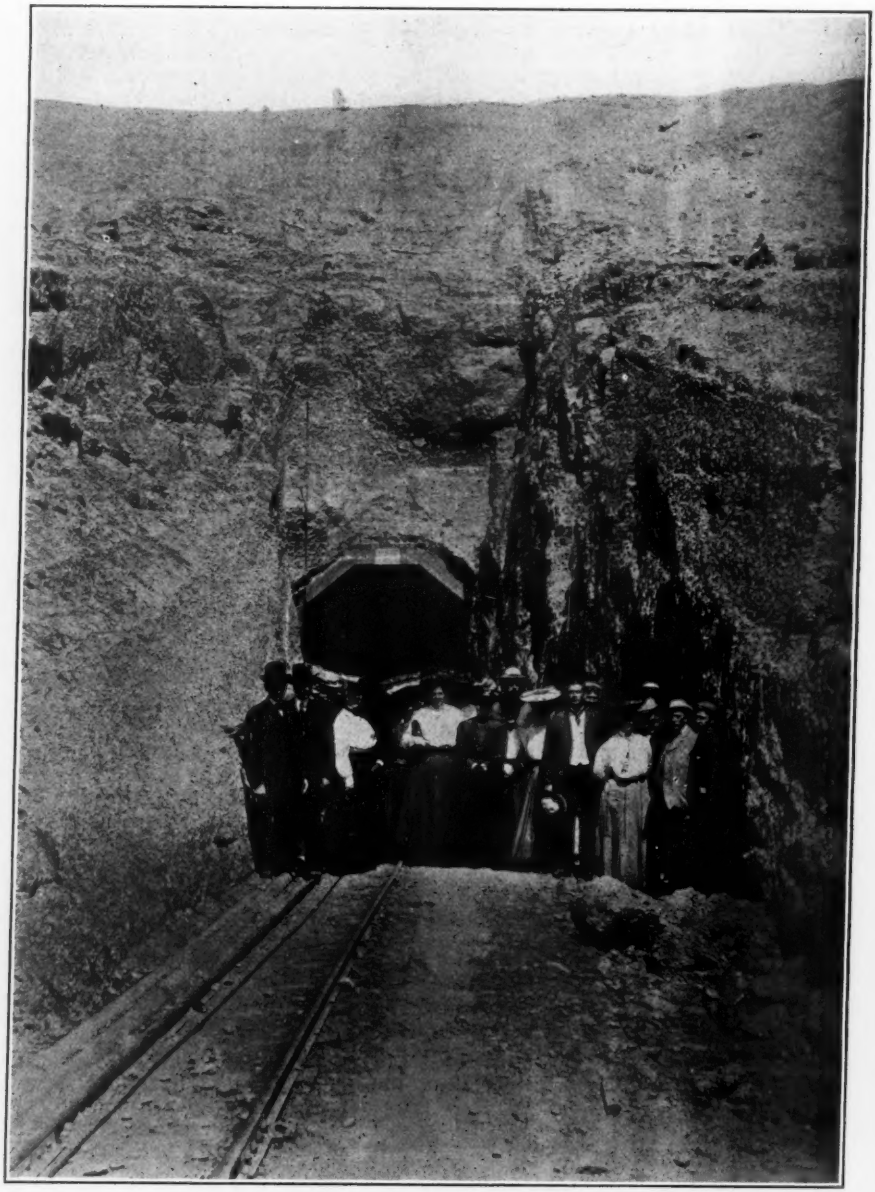
THE ENGINEER in charge of work on the Gunnison tunnel, Uncompahgre irrigation project, Colo., reports that 718 feet were excavated during July, making the total amount of tunnel excavated to date 14,614 linear feet. Less headway was made in July than in previous months on account of the friable material encountered in heading No. 2, the accident by a premature explosion in heading No. 1, and the quantity of water flowing in at the latter heading.

Headings 3 and 4 have finally been brought together, and the most disagreeable part of the work is now over. This is the portion under the broad valley of Cedar Creek, where the tunnel has been for nearly a mile in river sands and gravels, clay and soft shale. Heading No. 4 was driven from the outlet in the valley, and number 3 from a shaft a mile away, under conditions such that it was very difficult to give directions so that the tunnels driven towards each other would exactly meet.

The completion of this portion of the work leaves it possible to concentrate work on the headings numbers 1 and 2, which are under the main portion of the mountain. In No. 1 the material is a hard reddish quartz or coarse granite, changing to a mica shist. In this portion the progress has been upwards of 12 feet a day, while in the softer black shale in heading No. 2 the progress has been over 20 feet a day.

The work on the tunnel was delayed by a curious condition. This was due to a heading advanced to a point where is was passing through a great acmumulation of sea shells. Thousands upon thousands of them imbedded in the rock were dug out, some of them of gigantic size—upwards of three feet or even more in diameter.

The process of excavating the shells was easy but they rendered the ground exceedingly treacherous. A few of these large shells imbedded in the roof make a point of weakness, and without warning a mass of a hundred pounds



Congressional Inspection Party Mouth of Gunnison Tunnel, Now 15,000 Feet Within the Mountain.

Surveying in the Canyon

An Engineer of the Reclamation Service in Exploring the Gunnison Canyon is Forced to Swim

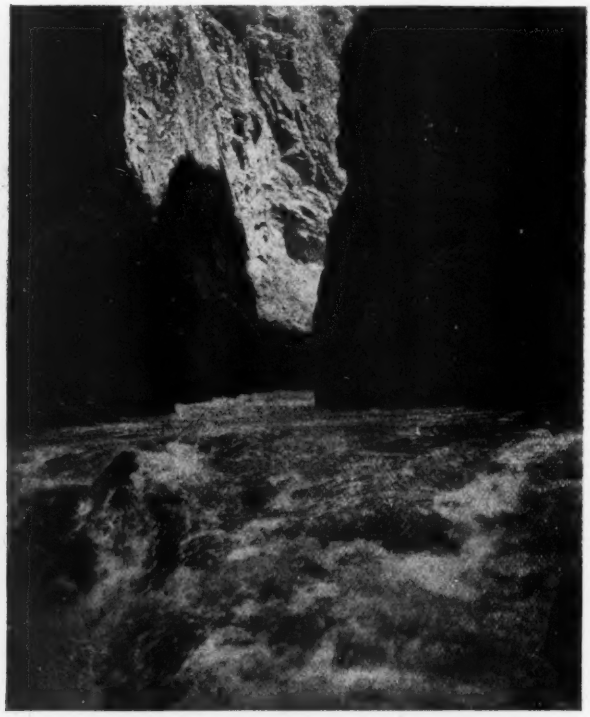
or even of several tons of the black shale carrying the shells might be precipitated upon the workmen. It was therefore necessary to support the roof of the tunnel with timber for every foot of advance in order to protect the workmen from injury or death.

It is curious that these shells deposited in the ocean millions of years ago are now being brought to light and are endangering the lives of creatures hundreds of centuries younger than they.

Each one of the shells at one time held a living organism, whose bulk would be sufficient to make a meal for a dozen men.

The work on the Gunnison tunnel is being watched with a great deal of interest by engineers throughout the country by reason of the fact that it is the longest and largest underground waterway of its kind in the world. Its total length will be 30,000 feet, its cross section 10½ by 11½ feet, and its capacity 13,000 cubic feet per second. It is to be cement lined throughout and completed in 1908 at an approximate cost of $2,000,000. For the greater part of its length the tunnel is in solid granite, in some places 2,000 feet below the surface of Vernal Mesa.

This tunnel will carry water from Gunnison Canyon over into the valley of the Uncompahgre River where it will be used to irrigate about 150,000 acres of fine agricultural land.



Dam Site in the Grand Canyon of the Gunnison River, Colorado

THE MADISON PROJECT

Plan to Reclaim Large Area of Montana Arid Land

AN investigation of the Madison River irrigation project, Mont., was recently completed by the engineers of the U. S. Reclamation Service, and a report made to the Secretary of the Interior. Numerous surveys have been made by various corporations and individuals since 1887 for the purpose of locating a feasible irrigation system in this vicinity, but no practicable project was found. Owing to the fact that approximately 150,000 acres of land very advantageously situated with respect to market, and with exceptionally good railroad facilities, located near Helena are believed to be reclaimable from Madison River, a careful reconnaissance was made by the Reclamation Service in 1905.

The main unit of the project outlined by the engineers consists of about 43,000 acres of land in and adjacent to Prickly Pear Valley near Helena; a second tract of about 53,000 acres lies in Crow Creek Valley on the west side of the Missouri River near Radersburg, and smaller tracts aggregating about 52,000 acres bring the total reclaimable area up to approximately 148,000 acres.

The plan in brief is to construct a storage dam in Madison River Canyon, the stored water to be discharged into Madison River as required, and at a point about seven miles below the dam, near the mouth of Cottonwood Gulch, diverted by means of a weir into a canal on the west bank of the river. This canal will run in a northerly direction along the left bank of Madison River for about thirty miles, crossing the Jefferson River by a siphon over three miles long in the vicinity of Willow Creek, and thence parallel but at some distance from the west bank of Missouri River to a point on McClellan Creek, into which its waters discharge. For about two and one-half miles the channels of McClellan and Prickly Pear creeks will be used, the waters being diverted from Prickly Pear Creek near East Helena, the canal then encircling Prickly Pear Valley, discharging into a coulee at its lower end.

The entire length of the canal would be 150 miles, including sixteen miles of tunnels, twenty-seven and three-quarer miles of concrete lined sections, four miles of siphon pressure pipe, 99½ miles of earth canal and two and one-half miles of natural stream channel. There is one drop of seventy feet, and a drop of 160 feet in the stream channel.

A small independent part of the project contemplates the irrigation of about 16,000 acres on the east bank of Missouri River in the vicinity of Toston and Townsend, by a canal diverting water from the Missouri River on its right bank about three and one-half miles above Toston and running in a general northerly direction for about thirty miles. There are 5,140 acres of cultvated land below the projected canal line location irrigated from Dry, Greyson, Gurnet, and Duck Creeks and Confederate Gulch. If satisfactory arrangements could be made with the owners of these water rights their lands could be watered from the canal and the water from the creeks used on lands above the canal, and this area, 5,140 acres, now watered, has been included with the 16,800 acres of irrigable land. There are probably 3,000 acres north of Confederate Gulch that could be irrigated by extending this canal to Avalanche Gulch, but as this would involve many additional miles of canal it has not been considered.

Most of the land is in private ownership. The crops are principally alfalfa, oats, wheat, and rye.

The estimated cost of the project without storage is $254,000. On a basis of 16,000 acres this gives a cost per acre of $15.12; adding $5 per acre for maintenance and operation for ten years, gives a cost of practically $20 per acre without storage. Sufficient data is not at hand to warrant an estimate on the cost of storage, which must be known before it is possible to decide upon the feasibility of the project.

The unregulated discharge of the Madison River at the proposed point of diversion would, in some years, be sufficient to supply the canal throughout the irrigating season, but in other years there would be a shortage in July, August, and September. On account of this shortage, and for the further reason that the entire low water flow of Madison River is being used for power development at points lower down on the Missouri River, it will be necessary to regulate by shortage practically the entire discharge of Madison River, and this would be provided for by the dam in Madison River Canyon, which would create a reservoir with a capacity of 600,000 acre-feet.

The total estimated cost of the entire Madison project is $14,413,000. On a basis of 147,800 acres this gives a cost per acre of $97.50. Allowing $5 per acre for ten years maintenance and operation brings the cost up to about $102.50 per acre. The long canal line with its expensive river crossings, tunnels and other structures necessitated by the topogrphy of the country, are responsible for the high cost of construction.

CALIFORNIA GROUND WATERS

Important Publications on Southern California by U. S. Geological Survey

THE RESULTS of an extremely practical and purposeful investigation of the ground water resources of the coastal plain region of southern California have recently been published by the United States Geological Survey. These reports cover the region along the coast from Santa Monica to Aliso Creek, and extend inland over the coastal plain to the foothills from San Pasqual on the northwest, through Santa Anita, Glendora, Pomona, and San Bernardino, to San Jacinto on the southeast.

Throughout this whole area the people are dependent mainly upon ground water for their water supply, and much of the prosperity that has been realized in this country has resulted from irrigation by ground waters. Therefore the future is largely dependent upon the availability of these waters and their permanence.

The reports mentioned deal with these questions in a practical way and show where ground waters may be obtained, the depth at which they occur, and what may ultimately be expected if the present improvident use of the water is continued. In order that the reports may be distributed in the most helpful manner the region has been divided into the western, central, and eastern sections, and each has been treated in a separate bulletin.

The western section includes the Redondo and southern half of the Santa Monica quadrangles. This region may be geographically defined as that part of the country lying westward from a line running north from San Pedro Bay through Los Angeles and Glendive to La Crescento. The central section includes the Downey and Las Bolas quadrangles, and may be geographically defined as land lying

eastward from the line above located to a north and south boundary defined by Westminster, Whittier, and Monrovia. While the central section includes the area lying to the east of this as far as San Bernardino and San Jacinto.

Completed tables giving the facts concerning the wells throughout this region are included in the reports, They show the yield of each well, the capacity, and depth at which water occurs, as well as the cost of operation.

With reference to the supply of the entire region the report states that in all of the important basins there has been during the last ten years a general reduction in the yield of the artesian wells. The last ten years have constituted a period of low rainfall, and as a result the ground water supply has been diminished, and it is evident that there should be no further increase of the drafts upon the underground resources. The rate of this decrease even under the influence of the great development that has taken place has been very slow, and while it is probable that in some basins some of the favorably located wells will never cease to flow, the shrinkage must continue in other places unless there is a concerted effort upon the part of the irrigators to be economical in the use of water.

The summary given by the author of these reports, Mr. Walter C. Mendenhall, is as follows:

The supply is large, since it consists of the water saturating all that part of the coastal plain gravels within about 250 feet from the surface over an area of 600 or 700 square miles.

The annual additions to the supply are large, consisting of a part of the flood waters of the San Gabriel, Los Angeles, and Santa Ana Rivers, together with the return waters from irrigation and the local rainfall. The drafts upon this supply are also large and seem certainly to be in excess of the supply in certain parts of the region.

With present developments the water plane must be expected to decline slowly and the artesian to shrink until drainage is checked by this shrinkage to a point where it no longer exceeds the supply. This decline should not prove serious if present developments are not increased, but so long as this development continues at a rate which increases the output, the shrinkage will also continue.

The lowering of the ground water level and shrinkage of artesian areas will no doubt be interrupted by periods of rising water levels.

The shrinkage of an artesian belt will be manifest along its northern edge, and the effect farther south will be rather a decrease of flow and a lessening of pressure.

Shallow artesian wells will generalley be affected earlier and to a more marked extent than the deeper ones.

One of the maps included in this series of reports shows the artesian areas and the shrinkage which has already occurred. For example, the great artesian area running along the coast from a point west of Los Angeles to a point south of Santa Ana already shows a shrinkage along its northern and eastern borders equal to about one-fourth of the original area, while that south of Pomona shows a shrinkage of approximately 10 per cent. The San Bernardino area has likewise been reduced about one-half, and that north of San Jacinto shows a shrinkage along its northern border equal to about one-fifth of the original artesian area.

These reports should be consulted by every irrigator along the coastal plain. They give most potent warnings concerning the loss of water supply which, it appears, may be avoided if intelligent measures are adopted. Inasmuch as this garden spot of North America has been developed solely as a result of irrigation by ground waters, it appears that the inhabitants of the region can do no better than to organize and adopt such measures as are recommended in these reports.

Government Irrigation Work During the Month

For Lippincott's Place

Mr. Louis C. Hill has been designated supervising engineer of the southern part of California, including Colorado River and the Yuma project, in addition to his work in Arizona, to fill the place made vacant by the resignation of Mr. J. B. Lippincott.

Mr. Hill was born in Michigan and graduated from the State University in 1886. He was engaged constantly in railroad, mining, and canal work until 1903, when he received an appointment in the United States Reclamation Service. He has charge of the construction of the Salt River project, which is now in course of construction and is already world famous for its wonderful engineering features.

Here one of the highest dams in the world is being erected, creating an artificial lake twenty-five miles long and 200 feet deep against the dam. A cement mill with a capacity of 300 barrels per day is in operation, turning out first-class cement for use in constructing the dam, lining ditches, and tunnels. The work also involves a power house, power canal, electric transmission line, and the rebuilding of a considerable part of the distributing system in Salt River valley. Saw mills have been erected to furnish lumber for the system, and over one hundred miles of wagon road were constructed. Sixty miles of this road connects the outside world with the dam site, which is in an almost inaccessible canyon, and is used for hauling supplies to the army of workmen employed there. Engineers who have driven over it pronounce it a marvel of engineering skill, unequalled in this country.

Mr. Hill is regarded as one of the ablest engineers and executives in the country, and although the loss of Mr. Lippincott's services was a severe one, the people of southern California are to be congratulated upon the wise choice of his successor.

Henny's Appointment

Mr. D. C. Henny has been designated as supervising engineer for California, excepting that portion of the southern part of the State including the Colorado River and Yuma project, which has been assigned to L. C. Hill, supervising engineer for Arizona, and the Owens Valley under L. H. Taylor, supervising engineer for Nevada.

Mr. Henny now has charge practically of the entire Pacific coast area, including the States of Washington, Oregon, and California. This change was brought about by the resignation of Mr. J. B. Lippincott, supervising engineer for California and the Klamath irrigation project lying partly in Oregon.

Mr. Henny is a graduate of the Government Polytechnic School, Delft, Holland. He was engaged for several years in reclamation work and railroad location in Holland, and has been engaged in railroad construction in Iowa; in waterworks construction in various Eastern States; in railroad construction in Colorado; bridge work

in Missouri; tunnel construction, New York; and in many other important positions throughout the United States. Both the Reclamation Service and the states to which his services have been assigned are to be congratulated on the possession of one of the finest engineers in the country. His headquarters at present are at Portland, Ore.

HOMER HAMLIN

A well known engineer who recently resigned from the Reclamation Service to become City Engineer of Los Angeles, California

Hamlin Resigns

Mr. Homer Hamlin, of the U. S. Reclamation Service, and district engineer in charge of the Yuma irrigation project, California and Arizona, has tendered his resignation to the chief engineer and will accept the position of city engineer of Los Angeles, Cal. His resignation will take effect September 1st.

Mr. Hamlin was born and educated in Minnesota. He has had wide experience in engineering, having been engaged with the city engineer, San Diego, Cal., in general engineering and surveying in that city, as assistant to the United States engineer in survey for fortifications on Point Loma

and Coronado Beach, draftsman in the surveyor's and city engineer's office in Los Angeles. In 1901 he was employed by the United States Geological Survey in hydrographic and geological investigations, and in 1903 he received an appointment as engineer in the Reclamation Service.

Mr. Hamlin's resignation was accepted with much regret by the officials of the service, as the demand for good engineers is greatly in excess of the supply. This is especially true in Government work on account of the low salaries paid by Uncle Sam as compared with those received in private practice.

Engineer Drowned

Information has been received at the Washington office that Mr. I. W. Huffaker, of Wheatland, Cal., assistant engineer in the U. S. Reclamation Service, has been drowned in one of the canals of the Truckee-Carson irrigation project, about five miles west of Fallon, Nev.

While awaiting the arrival of a survey party Mr. Huffaker and one of his assistants decided to go in swimming at a point where the water surface of the canal was about 60 feet and the depth of water between eight and nine feet. Both of them were poor swimmers and he sank while attempting to swim across the canal. His companion, Mr. Wilbur, was barely able to save himself.

Mr. Huffaker has been engaged in general surveying in Montana and in the construction of iron smelters. In 1903 he was appointed engineering aid in the Reclamation Service on Walker River basin and since the fall of that year has been constantly engaged on the Truckee-Carson project, having had charge of the construction of the Carson River diversion dam and Lake Tahoe outlet regulation work.

Hondo Project

Mr. B. M. Hall, of the Reclamation Service, and supervising engineer for New Mexico, Texas, and Oklahoma, who is in Washington for a few days on business connected with his district, reports a most promising state of affairs on the Hondo irrigation project in southeastern New Mexico.

All contracts are completed, earthwork on the laterals is finished, and nothing now remains undone except some of the small structures in the distributing system, and some puddling in the reservoir. This work is being carried on by force account under the supervision of the engineers. The settlers have been receiving the usual low water supply throughout the season, but next spring they will enter into their proper heritage, the reservoir being completed and an ample water supply for all needs assured.

Although the land under this project is all in private ownership, Mr. Hall reports that most of the farmers are cutting their farms down to forty acres. This action will insure a dense population, more intensive cultivation, and a consequence increase in the value of the land. The marvelous results of irrigation in this section when sufficient water is applied has been demonstrated in the Roswell district lying just to the east of the Hondo project. Four crops of alfalfa are harvested, while corn, garden truck, cantaloupes, grapes, apples and other fruits produce abundantly. The delicious flavor of irrigated fruits is becoming well known, and the apples which are shipped to Chicago and other Eastern markets command a high price.

Next year one-tenth of the cost of construction of this project, or $33,360, will be returned to the reclamation fund to be used again in the construction of other projects.

Contracts with Water Users

The Secretary of the Interior has executed a contract with the Sunnyside Water Users' Association, Washington, to secure repayment to the United States of moneys expended in the construction of the Sunnyside irrigation project, Wash.

A contract on behalf of the United States with the Yuma County Water Users' Association, organized in con-

nection with the Yuma irrigation project, California-Arizona, to secure the return to the Government of the cost of the Yuma project, has also been consummated.

Nebraska Phone

The Secretary of the Interior has approved the contract entered into by John E. Field on behalf of the United States Government, and the Platte Valley Telephone Company, of Scottsbluff, Nebr., whereby the above named company agrees to furnish telephone service in connection with the North Platte irrigation project, Nebraska and Wyoming.

It was found necessary to establish telephone connections between the headgates of the Interstate Canal, located at Whalen, Wyo., and the various headquarters, camps and stations of the Reclamation Service, in order to expediate the work of constructing the irrigation system. Eleven stations will be installed at the various camps and the company will place additional wires on the poles of its lines now in operation or to be constructed between Whalen, Wyo., and Camp No. 8 in Nebraska, and construct and maintain such new lines as may be necessary to connect the telephone stations with each other and with the various exchanges in the district lying between Guernsey, Wyo., and Bridgeport, Nebr. Long distance service may also be had with the Pathfinders dam site, located above Alcova, Wyo.

Montana Phone

The Secretary of the Interior has granted permission to the St. Mary's International Telephone Company, of Browning, Mont., to construct a telephone line on the Blackfeet Indian Reservation from Browning, on the Great Northern Railroad, northerly to the International boundary line through and by way of Babb, Teton County, Mont., a distance of about fifty miles.

Arrangements have been made with the company for the transmission of messages in connection with the Milk River project, which is being constructed for the irrigation of lands in northern and northeastern Montana by the U. S. Reclamation Service. This service will be of inestimable value in expediting the work on the project as well as in future operation of the system.

Ft. Shaw Lands

The Secretary of the Interior has authorized the engineers of theReclamation Service to survey and subdivide the lands in the Fort Shaw abandoned military reservation, Montana.

These lands are needed in connection with the Sun River irrigation project, which is designed to reclaim about 256,000 acres in the valley of Sun River. A large percentage of this land is public domain and lies in a broad prairie extending from Teton River on the north to Sun River on the south, a distance of thirty miles, and from the Rocky Mountains on the west to Missouri River on the east, a distance of seventy miles. The sum of $500,000 has been allotted from the reclamation fund for initiating this great work.

Examination of Clark Fork

In response to requests from the residents of Carbon County, Mont., the Reclamation Service recently made a reconnaissance of the elevations and approximate areas of irrigable lands on the east side of Clarke Fork near the Montana-Wyoming State line. It has long been the belief of settlers in that locality that large bodies of land are so situated as to be irrigable from Clarke Fork.

It was found that a tract of land known as Chapman Bench lies along Pat O'Hara Creek for a distance of twelve miles. This bench has an average width of one and one-half miles and contains approximately 12,000 acres of good land which lies well for distributing water. Owing to its high elevation above Clarke Fork Canyon, however, and the long rough country through which the canal would run, any scheme for irrigating the land from the waters of Clarke Fork is not considered feasible. There is no other tract of land from the lower end of

this bench north to Chance, Mont., with the exception of a few small scattering areas not worth considering.

Along the stream bed of Big Sand Coulee there are several small areas of land from one to several hundred acres in extent that lie low enough to be watered from the Fork, but these could all be readily handled by private capital. One tract of 3,000 acres in extent well up on the stream and at an elevation of approximately 4,400 feet above sea level, probably could be watered very economically by diverting water from the proposed high line canal of the Shoshone project. There is about 6,000 acres of good land on the Sand Coulee drainage. All the remaining land in the vicinity of Big Sand Coulee and to the east of the Chapman Bend is of sand dunes and bad land breaks. The tract of land known as Big Mesa is in the Shoshone drainage and is properly a part of that project. It is too high for irrigation from Clarke Fork without a dam several hundred feet in height and tunnels aggregating several miles in length.

The Month in Government Forest Work

Personal Mention

Mr. E. A. Sterling, in charge of forest extension in the Forest Service, has just returned from the Adirondacks, where he has been studying the forest planting work which is being done by both the State Forest Commission and the Cornell Forest School. On these plantations it was found that Scotch pine, white pine, and European larch are being grown so successfully that these trees may be regarded as specially well suited for reforestation work in this region. At Lake Clear, where the State work is in progress, Norway pine is now to be tried with every prospect of success. Douglas spruce, otherwise known as Western red fir, is also being planted. On the other hand, the soil is too poor for successful planting work with Norway spruce.

Mr. Sterling starts immediately for the West, to inspect extension work on the reserves. He will first visit Flagstaff, Arizona, and thence will proceed to California, will go up the coast and return by way of the Rocky Mountain reserves. The reserve extension work is growing in extent and importance constantly. In addition to the permanent planting stations, where seed beds and nurseries are maintained to supply plant material for planting work, either locally or at a distance, special attention is now being directed to the study of city watersheds lying in reserves. A number of reserves which surround or nearly touch cities and towns contain the sources which supply these places with water. To perpetuate and in many cases to increase the available water supply, forest planting is the most efficient, often the only means.

Another new project in extension work is the establishment of rangers' nurseries. Rangers will be encouraged and assisted to make a good showing in small nurseries, in which suitable species for planting in each locality are to be tried.

Mr. Bristow Adams, formerly associate editor of FORESTRY AND IRRIGATION, has been appointed to a position in the office of the editor, Forest Service. Mr. Adams is especially well fitted for his work with the government, having had a long experience in newspaper and editorial work. He will be particularly valuable to the Forest Service because he has had an intimate knowledge of the forest movement during the past five years, as well as a thorough understanding of irrigation problems which are often closely related to forestry. Readers of the magazine will recall a number of articles which Mr. Adms has contributed, both on forestry and irrigation subjects.

Mr. Gifford Pinchot, Forester of the U. S. Department of Agriculture, returns August 21 from Europe. He left Washington July 7 last. The National Irrigation Congress will be held at Boise, Idaho, September 3 to 8, inclusive, and owing to the close community of interests between the Reclamation Service and the Forest Service, this meeting will bring together a large number of those interested in forest work, both in public and private life. Mr. Pinchot, who has been invited by Gov. Pardee, of California, through the executive committee of the Congress, will attend. The Congress is the fourteenth held in the interest of irrigation.

Mr. William L. Hall, in charge of forest products, in the Forest Service, has been for some time in the West, where he is engaged in the administrative inspection of the timber tests being carried on at various points in cooperation with Western universities. His return is expected by the middle of September.

Captain James B. Adams, special fiscal agent of the Forest Service, and in charge of the office of records, is in the West, where he will preside at a number of meetings of forest supervisors. These meetings have for their object a fuller understanding on the part of forest officers of the provisions of the "Use Book," or manual of instructions and regulations for the use of the resources of forest reserves, as well as a closer and more personal relation between reserve officers and Washington. Reserve problems will be discussed and each supervisor will be able both to bring forward his own difficulties for solution and to contribute out of his own experience toward the solution of the difficulties of others.

The first of these supervisors' meetings will be held at Glenwood Springs, Colo., Augst 20 to 24, and the following forest officers will have instructions to attend: F. R. Sherwin, Jr., forest ranger in charge of the Pikes Peak Forest Reserve, Colo.; Thomas Hogan, forest ranger of the Park Range Forest Reserve, Colo.; Eugene Williams, supervisor of the West Mountains and San Isabel Forest Reserves, Colo.; R. W. Shellabarger, supervisor of the Cochetopa Forest Reserve, Colo.; James A. Blair, forest ranger in charge of the Leadville Forest Reserve, Colo.; W. R. Kruetzler, forest ranger in charge of the Gunnison Forest Reserve, Colo.; David Anderson, forest ranger in charge of the Battlement Mesa Forest Reserve, Colo.; Harry Gibler, forest ranger in charge of the White River Forest Reserve, Colo.; O. C. Snow, forest ranger in charge of the La Sal Forest Reserve, Colo.; H. N. Wheeler, supervisor of the Montezuma Forest Reserve, Colo.; F. O. Spencer, supervisor of the San Juan Forest Reserve, Colo., and forest inspector W. T. Cox. The second meeting will be held at Provo, Utah, headquarters of the Uinta Reserve, from August 25 to August 27. Forest Inspector Potter, in charge of grazing, and Forest Inspector Benedict, who alternates with Forest Inspector Du Bois in charge of the office

of reserve organization, will be present. The reserve officers instructed to attend are: C. T. Balle, supervisor of the Fish Lake Forest Reserve, Utah; G. H. Barney, supervisor of the Aquarius Forest Reserve, Utah; Sylvanus Collett, ranger in charge of the Dixie Forest Reserve, Utah; Charles F. Cooley, supervisor of the Grantsville Forest Reserve, Utah; J. F. Squires, supervisor of the Bear River Forest Reserve, Utah; William Hurst, supervisor of the Beaver Forest Reserve, Utah; Dan S. Pack, supervisor of the Payson Forest Reserve, Utah; E. H. Clarke, supervisor of the Salt Lake Forest Reserve, Utah; W. I. Pack, supervisor of the Uinta Forest Reserve, Utah; Lorum Pratt, supervisor of the Grand Canyon Forest Reserve (North), Ariz., and Timothy C. Hoyt, supervisor of the Sevier Forest Reserve, Utah. Forest Inspector W. W. Clark will also be present. The third meeting will take place at Flagstaff, Ariz., September 1 to 6. The following forest officers have been instructed to attend: Fred S. Breen, supervisor of the Black Mesa, San Francisco Mountains and Grand Canyon (South) Forest Reserves, Ariz.; R. C. McClure, supervisor of the Gila Forest Reserve, N. Mex.; C. T. McGlone, supervisor of the Chiricahua Forest Reserve, Ariz.; F. C. W. Pooler, supervisor of the Prescott Forest Reserve, Ariz.; W. H. Reed, forest ranger in charge of the Tonto Forest Reserve, Ariz.; Harold Marshall, forest ranger in charge of the Pinal Forest Reserve, Ariz.; T. F. Meagher, supervisor of the Santa Rita and Santa Catalina Forest Reserves, Ariz.; John W. Farmer, supervisor of the Mt. Graham Forest Reserve, Ariz.; John Kerr, supervisor of the Lincoln Forest Reserve, N. Mex.; L. F. Kneipp, supervisor of the Pecos River and Jemez Forest Reserves, N. Mex.; E. F. Morrissey, supervisor of the Wichita Forest Reserve, Okla.

Other meetings are to follow.

During July and August Thomas E. Will, of the Forest Service, has been delivering a number of illustrated lectures on forest problems in Oklahoma. Indiana and Kansas.

Boston Pulp Laboratory

The Forest Service has established a laboratory at 696 East First street, Boston, Mass., for the purpose of making investigations and experiments in the manufacture of sulphite or chemical wood pulps.

There are, generally speaking, two kinds of wood pulp, mechanical and chemical, the first obtained from grinding the wood and the second from a disintegration by chemicals. Caustic soda is used to a limited degree, but by far the greater part of the chemical pulp is made through the agency of sulphurous acid and is known as sulphite wood pulp. It is relied upon as the strength-giving stock in most of the cheaper grades of paper, being used in connection with the cheaper and less strong mechanical pulp, in the proportion of three or four parts in ten.

To supply the enormous demand for the sulphite product more than 1,500,000 cords of wood are used annually. Nearly four-fifths of this amount is spruce. A rapid diminution in the supply of standing spruce and a consequent marked increase in its cost are the results of this great and growing demand. Therefore a principal object of this laboratory is to experiment on the pulp-making possibilities of other woods, with reference to obtaining: First, a pulp that will approximate spruce pulp to replace it where spruce is now used; second, other fibers that may have properties peculiarly adapted to special kinds of paper making; third, a pulp of marketable value as a by-product from the waste material from sawmill and lumbering operations.

The laboratory is conducted in connection with a model plant which has a capacity of about 65 tons of pulp a day. It is equipped with a chipper, liquor-making apparatus, digester, screen, vats, and molds for making sheets of pulp, a press, and the boiler and engine required for operating the plant.

The samples of wood used will be collected by members of the Forest Service in order that there may be no

question as to their identification. After barking, the wood will be chipped, cooked in the model digester, blown out into the blow-off pit, washed and screened. The fiber will then be formed into sheets by hand, and the water removed with a power press.

The object of the Forest Service experiments will be to make sulphite pulp in this manner from a large variety of American woods. The various fibers will be studied miscroscopically, and good-sized samples of the pulps will be available for distribution among the pulp and paper makers that they may judge of the usefulness of the various pulps for general or specific purposes.

Ale and Beer Stock

Forty-three manufacturers of ale and beer barrel stock have sent reports of their output during 1905 to the Forest Service. These, in connection with previous statements from the manufacturers of the packages produced from this stock, give some insight into the importance of white oak, since that wood is the only one that can be used.

The total number of staves reported is 12,578,000, and of heading 2,167,000 sets. In round numbers that means material for approximately 1,000,000 packages, or an average of 12½ staves to the package, which is about the averages number of staves in the quarter-barrel size. A set of heading means material for one complete head, which may be of one or more pieces.

The returns from the different states show that Kentucky produced by far the largest quantities of both staves and headings.

No wood other than white oak will answer for ale and beer barrel stock, nor indeed for any cooperage intended to contain alcoholic liquids. Red oak has been used for oil to a slight extent, and also for vinegar and packing-house packages. Local use in Oregon, California, and Massachusetts makes fir, spruce, and pine, respectively, permissible but by no means preferable. Gum and cypress are used for sirup, and ash is used in small quantities for pork and miscellaneous packages. The white oak used for ale and beer packages must be of the very highest grade, for, unlike most other tight cooperage stock, it is split by hand instead of being sawed. Because of this method, only the choicest trees, straight-grained and free from knots or other defects, can be used.

A more detailed report will be published later.

Success in Kiln Drying

Manufacturers of red gum heading boards have been rather helpless against heavy losses from warping, molding, and checking, and, in addition, against the inconveniences of being obliged to wait for long periods of time for material to dry in the yard.

To improve these conditions, the Forest Service, in co-operation with a firm in Arkansas, undertook some experiments which show that red gum heading boards can be successfully dried green from the saw.

The details of the experiments were essentially different from other kiln-drying tests on cooperage stock, and the kiln itself was of a type that had never been used on such material. The kiln consists of a chamber 80 by 20 feet, the front part of which can be partitioned off by dropping a heavy canvas curtain. The whole kiln is made as nearly air-tight as possible, none of the heated air being allowed to escape nor any cold air to enter. The steam pipes which furnish the heat are distributed throughout the entire length of the kiln, as are also a series of condensing coils.

Condensation takes place in the upper portion of the kiln, which contains cold-water coils along one side, connected in pairs. Each pair of coils is controlled by a valve and a hot-water thermometer on the outside of the kiln, so that the temperature of the interior at any point is under complete control by the operator, and the rate of condensation can be made as rapid or as slow as desired. The circulation is created by means of those condensing coils. The currents of moist air have only to travel across the kiln to come in contact with the cold-water coils, and be freed of the moisture with

which they are saturated. The water is caught in a trough underneath the condensing coils, and passes out of the kiln through pipes.

When the boards enter the cool or wet end of the kiln, they are subjected to several hours of sweating at a temperature of 140 degrees Fahrenheit, the cold-water supply being disconnected from the first pair of condensing coils, and the canvas curtain dropped to form the sweating chamber. When the wood has been thoroughly sweated, the curtain is raised and the condensing coils are put in operation. Then evaporation and condensation take place throughout the whole kiln. The trucks are gradually moved along toward the hot or dry end of the kiln, where an average temperature of 180 degrees is maintained.

Considerable importance attaches to the piling of the heading boards upon the trucks in such a manner as to avoid molding, warping, and checking. To obviate the first difficulty, a space of not less than six or eight inches must be left between the ricks. Uneven lapping of boards either at ends or sides is sure to cause warping; and cross-sticks must be used at the ends of the boards to prevent warping and checking. The boards of the upper layer, being subjected to greater heat, and ordinarily without weight to hold them in shape, should have planks or some device superimposed to put the upper course under conditions similar to those lower in the pile; otherwise the topmost boards will warp.

Although it is not the general practice the removal of the bark on the edges of the boards by means of a rosser or an old jointing knife would hasten the drying, and tend to lessen mold, in addition to economizing space and saving the heat energy of the kiln.

The results of the treatment prove its success. As before stated, the boards were put into the kiln just as they came green from the saw. They were in the kiln from six to seven days, and when taken out they were found to be dry, free from mold, and practically without checks. Under other methods of drying at the same plant, 31 per cent of red gum heading boards had been warped; but in these experiments the warpage was decreased to 14 per cent, and with one truck load only 8 per cent of the boards was warped.

Mine Timbers

The following statistics on the timber used in the anthracite coal mines of Pennsylvania are compiled from the reports of the mine operators to the Forest Service and the Geological Survey.

Reports were reiceived from 216 collieries, producing approximately 83 per cent of the total anthracite tonnage of the United States. Figures for the remaining 17 per cent were computed, using as a basis the reports actually received, assuming that conditions and requirements were uniform throughout the state.

The results of the tabulations show that 121,565,000 feet board measure of sawed timber (equivalent to 10,130,000 cubic feet) and 52,440,000 cubic feet of round timber were used during 1905.

The total value of the sawed timber was $1,842,000, or $15 per thousand feet board measure. The total value of the round timber was nearly double that of the sawed timber, being $3,468,000, or $6.60 per 100 solid cubic feet—the approximate equivalent of the average standard cord of 128 cubic feet. The total value of the round and sawed timber combined was $5,310,000, or about 8½ cents per long ton of coal mined, using as a basis for the calculation the production in 1905—in round numbers 61,000,000 long tons.

So far as reported, the kinds of wood have been tabulated separately, but in many cases the operators were unable to furnish information in regard to the quantity of each species used, and it has therefore been neces-

sary to classify a large amount as "mixed" or "miscellaneous."

Round Timber.

KIND	Cubic Feet
Yellow Pine	9,250,000
Oak	6,220,000
Hemlock	1,180,000
Pitch Pine	590,000
Chestnut	444,000
Beech	236,000
Jack Pine	165,000
Spruce	115,000
Mixed Hardwoods	10,263,000
Mixed Softwoods	477,000
Miscellaneous	23,500,000
Total	52,440,000

Of the species used for round timber, yellow pine, of which a large amount is loblolly pine from the South, furnishes one-half. Oak ranks next, but furnishes a much smaller proportion according to the reports. The oak would unquestionably be increased if the large items reported as "mixed hardwoods" and "miscellaneous" could be separated into species, and it is not improbable that oak would then displace yellow pine in rank.

Sawed Timber.

KIND	Board Feet
Hemlock	63,600,000
Yellow Pine	14,200,000
Oak	2,860,000
Maple	1,740,000
Spruce	371,000
White Pine	328,000
Pitch Pine	84,000
Mixed Hardwoods	28,642,000
Mixed Softwoods	1,370,000
Miscellaneous	8,370,000
Total	121,565,000

For sawed timber hemlock holds first place in quantity, while yellow pine ranks next. The amount of oak reported is doubtless too small, but an explanation is found in the classification for "mixed hardwoods" and "miscellaneous," which ontains over 37,000,000 feet board measure, of which probably a large amount is oak.

WOODLOT THINNING

Description of Work Done at Michigan Agricultural College

BY

PROFESSOR E. E. BOGUE

ONE of the woodlots on the Michigan Agricultural College farm contains seventy-seven acres. Ten years ago ten acres of this piece were cut over and all of the trees large enough for wood were taken out. It has been allowed to grow undisturbed. In May of the present year a class of forestry students thinned seven-tenths of an acre of this cut-over land. The accompanying illustration shows the students at work.

An accurate record was kept of the number and size of each species cut. The table here presented shows the twenty species found growing on the plat arranged from left to right in order of occurrence on the area. The plat selected was considered to be a fair average. It was necessary to leave some specimens of the less desirable species, such as maple, in order to have sufficient shade to keep out grass. It will be noticed that a few small specimens of undesirable species were found in the last count. This comes about from their having been over-looked when cutting.

Based on this fraction of an acre calculation is made as to the number of each species per acre and the whole number, which is 5,562. This num-

Diameter in inches breast high		Soft Maple	Beech	Hard Maple	Ironwood	Dogwood	Black Cherry	Sassafras	Witchhazel	Basswood	Red Oak	Blue Beech	Juneberry	White Oak	Hickory	White Ash	Whitewood	Hickory	Elm	Thornapple	Poplar	Totals		Diameter in inches breast high
½	Cut	341	319	183	159	139	9	15	103	7	3	36	20	8		4		1		4		1338	Cut	½
	Left	12			1	1	16			2	10											61	Left	
1	Cut	316	122	188	124	82	21		24	15	3	30	38	1		3	1		2			1008	Cut	1
	Left	15		4	1		34	39		10	25			23	3	2		3				129	Left	
1½	Cut	119	29	29	33	19	9	39	1	3		8	10	3						1		303	Cut	1½
	Left	19		4	5		39			6	12			10	4	2		2				110	Left	
2	Cut	83	23	26	16	16	7	65	1	4	5	3	8	1		10	2			1	1	259	Cut	2
	Left	20		8			36	2		7	18			14	3	2		3				127	Left	
2½	Cut	34	7	10	4	1	1	28		2	9	3	2	5								93	Cut	2½
	Left	18	1	2			30	2		10								3				87	Left	
3	Cut	31	7	6	2	18		31		4	6	1		7		6	1		2			102	Cut	3
	Left	27	4	4	1		22	2		3								1				91	Left	
3½	Cut	6	2	1	1	2		3			3		3			4	2					16	Cut	3½
	Left	6		1	1		7	1		8	3							1				33	Left	
4	Cut	6	3	2	3	12		3		2				3		1	3					31	Cut	4
	Left	7		6			8			8	1					2						39	Left	
5	Cut	1	1	1	5	4		4									3					16	Cut	5
	Left	9		3			5			5	1					2						28	Left	
6	Cut				2	1	7			2				1	1	1	1				1	3	Cut	6
	Left																					14	Left	
7	Cut	2			1		2															3	Cut	7
	Left	2																				4	Left	
10 Average Diameter in inches	Left	1 68	.88	1.14	1.03	1.20	1.88	1.96	.77	2.35	1.65	.95	1.17	1.68	2.04	2.12	3.73	1.45	1.89	1.33	2.88	1	Left	10
										1												1.35		
Total Cut		937	513	446	350	294	47	227	129	37	8	81	81	5	5	3	1	11	9	6	2	3172	Cut	
Total Left		135	5	32	8	1	206	7		62	85			71	50	30	10				2	724	Left	
Grand Total		1072	618	478	358	296	253	234	129	99	93	81	81	76	55	33	11	11	9	6	4	3896		
Tot. per acre		1531	740	683	511	421	361	334	184	141	133	115	115	108	79	47	16	16	13	8	6	5562		

ber is much larger than is usually found in woodlots, especially those that have been pastured and those where the trees are older. In this piece of timber grape vines and bitter-sweet have hindered the growth considerably by climbing up and shading undergrowth. Many of these had been cut years previous and the few that were over-looked at that time showed what might have been the condition at the time of thinning.

At the rate this work was done it would take a man six days to thin one acre, but a man accustomed to physical labor and the use of the ax ought to thin an acre of this timber in two or three days. Old stands of timber where a large percent of the small stuff has been smothered out could be thinned much more rapidly. This thinning might better have been done five years ago, for then the trees to be saved would have been produced. Some of these now are too tall and slender to stand erect when those around them have been removed.

By taking the total per acre of the eight valuable species black cherry, basswood, red oak, white oak, bitternut, white ash, hickory, and whitewood , we have a total of 901 trees or a stand, if evenly distributed, where the trees would be between six and seven feet apart each way.

The average diameter for each species and for all was calculated. Arranged from greatest to least, the species have the following rank and average diameter:

Whitewood 3.73.
Poplar 2.88.
Basswood 2.35.
White ash 2.12.
Bitternut 2.12.
Sassafras 1.96.
Elm 1.89.
Black cherry 1.88.
White oak 1.68.
Soft maple 1.68.
Red oak 1.65.
Hickory 1.45.
Thorn apple 1.33.
Dogwood 1.20.

Forestry Students Thinning a Woodlot at Michigan Agricultural College

Juneberry 1.17.
Hard maple 1.14.
Ironwood 1.03.
Blue beech .95.
Beech .88.
Witch hazel .77.
Average 1.35.

The number of trees in this investigation is not sufficient to make far-reaching conclusions, but they are indicative and are in accord with what one who has given the subject study might expect. It is doubtless true that the first twelve species named were largely produced as coppice.

The list shows that sassafras, soft maple, and all in the list after hickory, should be cut out and their place given to better species. Elm is questionable because of the low price at which the timber sells as compared with other timber and the habit the tree has of branching low and forming injurious crotches. The wood from the thinning pays the cost of the work.

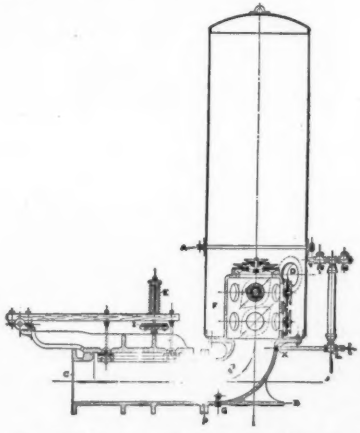
PUMPING WATER

Economic Methods of Lifting Water for Irrigation by Hydraulic Rams

FOR that class of irrigation problems which presents the conditions of a moderate fall of water available for power, and where it is required to raise a portion of the water to a higher level, or even to a series of higher levels, there is no more efficient or appropriate machine for pumping than the Rife Hydraulic Ram. This statement is true for cases where the water fall is from 2 to 50 feet, and the Rams will deliver, approximately, ⅓ of the water used 2½ times as high as the fall, 1-6 five times, 1-12 ten times, etc.

A Rifle Hydraulic Ram will pump with good efficiency against heads of 25 to 30 times the amount of the fall. It is true the efficiency falls off as the ratio between the power head and pumping head increases. At a low ratio of about three to one a Rife Ram will have an efficiency of over 90 per cent, whereas at a ratio of twelve to fifteen to one the efficiency will be as high as 70 per cent; and with extreme ratios of power head to force head the efficiency need not fall below 60 per cent.

The general impression of an hydraulic ram is that of the small machine usually used for the supply of a small country house where there is a flow of water available for power of, say, 4 to 50 gallons per minute and the water used very wastefully, but there is another side to the ram question, as the principle of the machine is such that it permits the highest efficiencies, and when rams are built on the line of good hydraulic engineering, high efficiencies may be easily realized.



No. 120 Single. Capacity 750 G.P.M. Weight 3300 pounds
Fig. 1. Cross Section of Hydraulic Ram

There is also practically no limit to the size to which the Rife hydraulic ram may be constructed. Accounts of many tests with Rife hydraulic rams have been published from time to time in the engineering press of recent years, and, in comparison with other forms of pumping machinery, the ram possesses marked advantages, and it is entirely automatic and runs constantly without attention or expense. It is practically without wearing parts, such as require lubrication or frequent adjustments, and is therefore not in need of the care of an attendant. The operation is most reliable, and the repairs are few, owing to the small number of parts which are liable to derangement; it need not be protected from the weather and will work equally well out of doors and not covered, and foundations are unnecessary.

The illustrations show one of the larger sizes of the modern hydraulic rams as built for the United States Government, and also the method of installation at the Naval Coaling station in Bradford, R. I. Two of these machines were put in during the summer of 1903 for pumping water into a tank which furnishes fire protection, and also supplies the various buildings on the grounds and the vessels which tie up to the dock. Careful tests were made of the plant when completed by Government engineers, and the rams were shown to develop an average efficiency of 90 per cent as per Government test as follows:

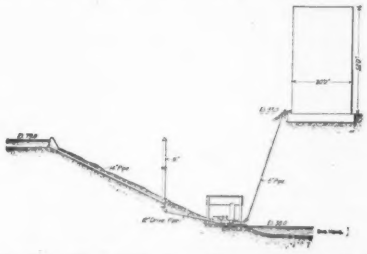


Fig. 2. Hydraulic Ram Connections. U. S. Coaling Station, Narragansett Bay, R. I.

TWO GOVERNMENT TESTS ON NO. 120 HYDRAULIC ENGINES AT U.S. NAVAL COALING STATION, NARRAGANSETT BAY, NEWPORT, R. I.

Q Total water used by ram.
q Water delivered into stand pipes.
H Power head on ram.
h Pumping head on ram.
Q 582 gallons per minute.
q 232 gallons per minute.
H 36¾ feet.
h 84 feet.
Strokes 130. Efficiency 91.25 per cent.
Q 578 gallons per minute.
q 228 gallons per minute.
H 37¼ feet.
h 84 feet.
Strokes 130. Efficiency 89.06 per cent.

These rams could use 750 gallons per minute each. 582 was all available when tests were made.

A number of such machines have been supplied by the Rife Engine Company, New York city, for irrigation purposes in the South and West, and also to sugar plantations in South America and the Hawaiian Islands.

Cotton. Its Cultivation, Marketing Manufacture and the Problems of the Cotton World. By Charles William Burkett and Clarence Hamilton Poe, Pp. 331; Illustrated with many half-tones. Price $2 net. Doubleday, Page & Co.

In calling attention to the undoubted value of this book the reviewer cannot do better than quote its introductory paragraph:

"Cotton—what a ropal plant it is!" Henry Grady once exclaimed. "The world waits in attendance on its growth; the shower that falls whispering on its leaves is heard around the earth; the sun that shines on it is tempered by the prayers of all the people; the frost that chills it and the dew that descends from the stars are noted, and the trespass of a little worm on its green leaf is more to England than the advance of the Russian army on her Asian outposts. It is gold from the instant it puts forth its tiny shoot. Its fibre is current in every bank, and when, loosing its fleeces to the sun, it floats a sunny banner that glorifies the fields of the humble farmer, that man is marshaled under a flag that will compel the allegiance of the world and wring a subsidy from every nation on earth."

To this the authors add:

"And in this flight of eloquence the Georgia orator did not overestimate the importance of the South's great staple crop. We do not exaggerate when we claim that no other plant in all the vegetable kingdom is of so much importance to the human race. Destroy any fruit plant in the world, and the men will grow other fruits. Let a lumber tree become extinct tomorrow, and other trees will take its place and our building go on as before. Even if corn or wheat or rice should perish from the earth, we could grow enough of the other crops, supplemented by rice, oats, barley, rye, peas, beans, etc., to feed both man and beast with comfort. But there is no substitute for cotton that can be cultivated on a large scale; no substitute, animal or vegetable product, with which civilization's present demand for clothing could be supplied.

"Nor is there any other plant with a history more marvelous or more romantic—more suggestive of the legend and mythology of its Oriental home, where it first began to serve mankind. If Frank Norris had lived in the South instead of California, what an Epic of the Cotton he might have given us—what a story of cotton, responding only to the warmth of a Southern sun and yielding a richer fleece than ever Jason dreamed of; Cotton, whose influence did most to bring us an alien race from Africa, and then did most to perpetuate in America the institution of human slavery; Cotton, on which a 'Dixie Land, the Land of Cotton,' once built its hopes while it waged one of the greatest wars of modern times; Cotton, which helped the vanquished people to their feet again, and now bids fair to restore them to a proud position in wealth and industry!"

The foregoing paragraphs breathe the glory of cotton, and the three hundred and more pages that follow tell, better than has been told before, of the raising and manufacturing the product of this wonderful plant. Professor Burkett and Mr. Poe had a splendid subject and they have produced a book in keeping with it. Anyone desiring an authoritative volume on the great cotton industry should not fail to secure this one.

The Packers, The Private Car Lines and the People. By J. Ogden Armour, Pp. 380; illustrated. Henry Altemus Co., Philadelphia.

Mr. Armour's book is made up of a series of articles that appeared first in the *Saturday Evening Post.* These papers break a "corporation silence," as he says, because unfair and even malicious attacks have been made by professional agitators and yellow magazines, upon the industry in which he has such a prominent part.

There is no doubt that packing house evils have been greatly exaggerated in certain directions recently, but that sweeping reforms were needed no one is now ignorant. It would have been much better for Mr. Armour and the great industry he represents if the "corporation silence" had been

broken sooner and the brazen indifference to public opinion set aside for once. There may be much that can be said for his side of the question, but he strikes the public at a time when it will not listen. There were days when "the public be damned" policy of corporations would work through letting the matter at issue die a natural death. But now the people insist on action, and in the case of the packers it was prompt and drastic. Their discomfiture contains a mighty valuable lesson for other large corporations —if they will not refuse to see it. Meantime we repeat that Mr. Armour's book, in the light of recent disclosures, is too late to entitle it to serious consideration.

Philippine Journal of Science. Vol. I, No. 4. Edited by Paul C. Freer, M. D., Ph. D., Bureau of Science, Manila, P. I.

This excellent scientific journal for May contains an exhaustive account of "The Vegetation of the Lamao Forest Reserve," by H. N. Whitford. Accompanying the text are twenty-seven full page plates that add much to the value of the article. Anyone interested in the trees of the Philippines should read Mr. Whitford's paper.

The Phantom of the Poles. By William Reed. Illustrated, Pp. 283. Price, $1.50. Walter S. Rockey Co., New York.

The author of this volume offers the unique theory that the earth is hollow, and that the poles so long sought after are but phantoms. He maintains that there are openings at the two extremities, North and South. He even offers illustrations showing the earth's interior. Taken altogether the valume may possibly be considered interesting romance by some and not worth while by others.

The State Engineer and His Relation to Irrigation. R. P. Teele, U. S. Department of Agriculture, Office of Experiment Stations, Bulletin 168; Pp. 99.

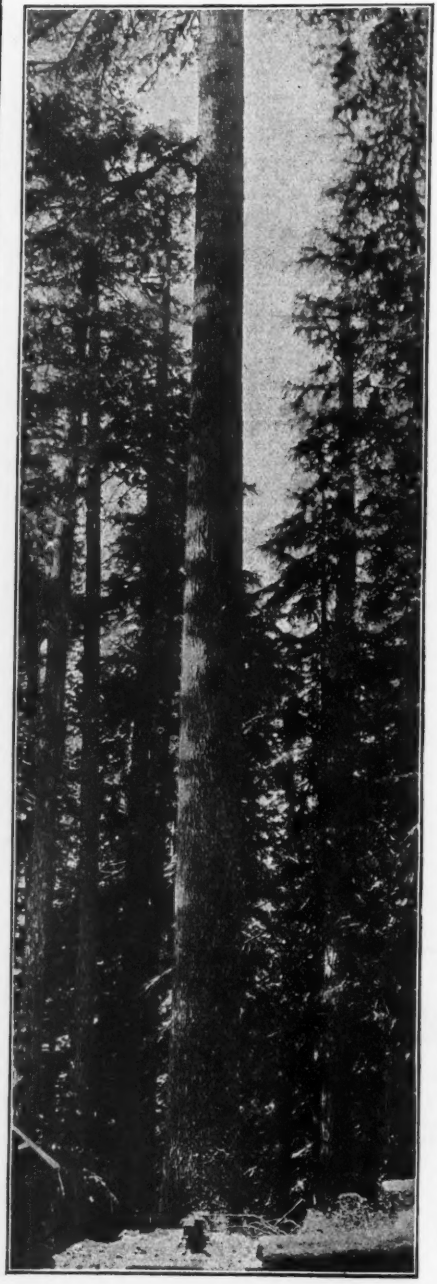
In this bulletin the duties of the State Engineer, an officer peculiar to the arid states, is very fully discussed. It takes up in order the various states which have now or have had a state engineer, including Wyoming, Nebraska, Idaho, Utah, Nevada, Montana, North Dakota, Oregon, and South Dakota. Mr. Teele discusses the definition of rights, their acquirement, the distribution of water, fees and other matters relating to irrigation practice. Altogether it presents a very comprehensive view of the irrigation situation in the States named.

The Western Pine—Destroying Bark-beetle. By J. L. Webb, special field agent, forest insect investigations, Bureau of Entomology, Bulletin 58, Part II. Illustrated; Pp. 30. Washington, D. C.

This bulletin contains the results of investigations made in central Idaho in 1905. It shows that if neglected and conditions are favorable this beetle is capable of destroying forests over a larger area. Its habits are described and remedies suggested for its control.

Ficus Elastica. By E. M. Coventry, deputy conservator of forests, Calcutta, India. Illustrated, Pp. 35.

This bulletin treats of the natural growth and artificial propagation of the *Ficus Elastica*, along with a description of the method of tapping the tree and of the preparation of rubber for the market. Personal observation as well as the literature of the subject have been the basis of this bulletin.



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DEPARTMENT OF THE INTERIOR, Washington, D. C., July 27, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, at Hazen, Nevada, until 2 o'clock, p. m., September 15, 1906, for the construction of about 82 miles of irrigation ditches, involving about 735,000 cubic yards of excavation, with structures and bridges, in Carson Sink Valley, Nevada. Particulars may be obtained from the Chief Engineer of the Reclamation Service, Washington, D. C., or the Supervising Engineer, Hazen, Nevada. THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, Washington, D. C., July 27, 1906. Sealed proposals will be received at the office of the Reclamation Service, Garden City, Kansas, until 2 o'clock p. m., September 28, 1906, for the construction of deep and shallow wells, suction pipes, pumping stations, siphons, concrete lined conduits, and fencing. Particulars may be obtained by application to the Chief Engineer of the Reclamation Service, Washington, D. C., or to the Engineer, Garden City, Kansas. THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, Washington, D. C., August 7, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Garden City, Kansas, until 10 o'clock a. m., September 28, 1906, for furnishing 5,000 barrels of Portland cement f. o. b. cars at bidder's mill. Particulars may be obtained by application to the Chief Engineer of the Reclamation Service, Washington, D. C., and the Engineer, Garden City, Kansas. THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, Washington, D. C., July 24, 1906. Sealed proposals will be received at the office of the Supervising Engineer, United States Reclamation Service, Portland, Oregon, until 3 o'clock p. m., September 17, 1906, for building the Cold Springs Dam, near Hermiston, Oregon, including about 694,000 cubic yards of earth and gravel excavation, about 3,100 cubic yards of rock excavation, about 3,110 cubic yards of concrete, and about 35,000 cubic yards of riprap and rock-fill. Particulars may be obtained at the offices of the U. S. Reclamation Service at Washington, D. C., Portland, Oregon, and Hermiston, Oregon. THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, United States Geological Survey, Reclamation Service, Washington, D. C., August 3, 1906. Sealed proposals will be received at the office of the Supervising Engineer, United States Reclamation Servise, Portland, Oregon, until 3 o'clock p. m., October 1, 1906, for building the main and lateral ditches of the distributing system, Umatilla Project, Oregon. The work is divided into two nearly equal schedules and includes about 315,000 cubic yards of earth and rock excavation. Particulars may be obained at the office of the United States Reclamation Service at Washington, D. C., Portland, Oregon, and Hermiston, Oregon. THOS. RYAN, Acting Secretary.

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DEPARTMENT OF THE INTERIOR, Washington, D. C., July 24, 1906. Sealed proposals will be received at the office of the United States Reclamation Service, Portland, Oregon, until 3 o'clock p. m., September 18, 1906, for furnishing 27,000 barrels more or less, of Portland cement, f. o. b. cars at manufacturer's shipping point. Particulars may be obtained by application to the Chief Engineer of the Reclamation Service, Washington, D. C., or to the Supervising Engineer, 351 Washington Street, Portland, Oregon. THOS. RYAN, Acting Secretary.

DEPARTMENT OF THE INTERIOR, Washington, D. C., July 24, 1906. Sealed proposals will be received at the office of the Supervising Engineer, United States Reclamation Service, Portland, Oregon, until 3 o'clock p. m., September 1, 1906, for the following works: Storage works near Conconully, Washington, including about 155,000 cubic yards of earth excavation, 4,000 cubic yards of rock excavation, 160 feet of tunnel, 1660 cubic yards of concrete. Particulars may be obtained at the office of the U. S. Reclamation Service at Washington, D. C., Portland, Oregon, and Pogue, Washington. THOS. RYAN, Acting Secretary.

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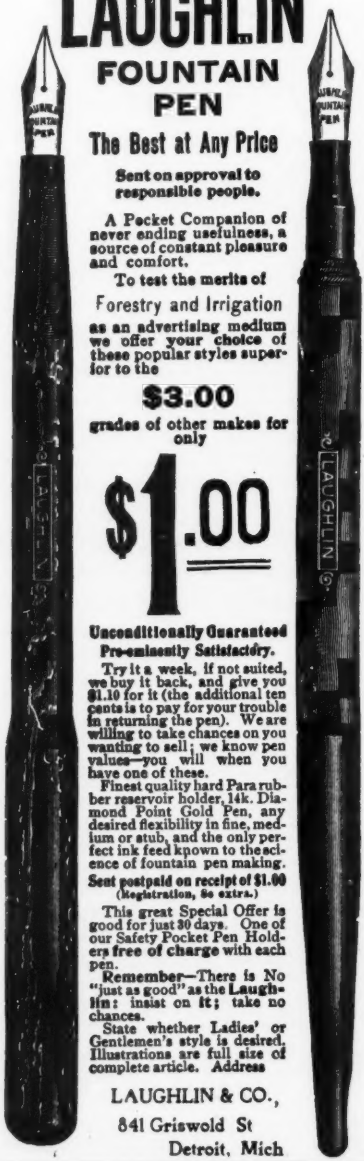

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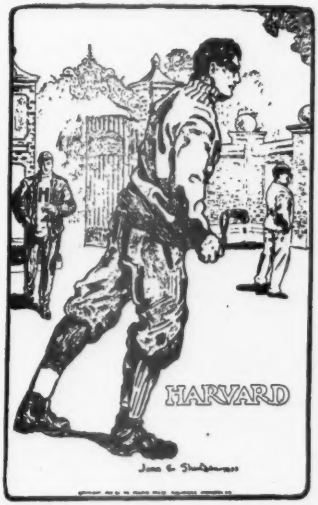

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The objects of the Association, as set forth in its Constitution, are as follows:

1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.

2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.

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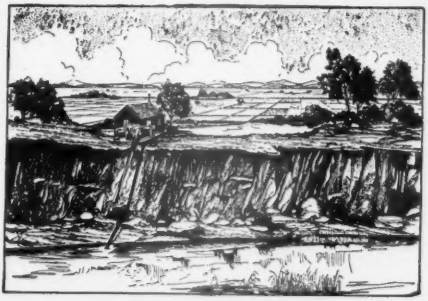
4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.

5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.

6. The holding of an annual Irrigation Convention, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the enconragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.



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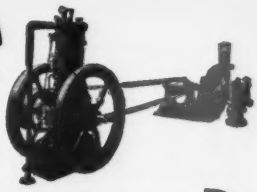

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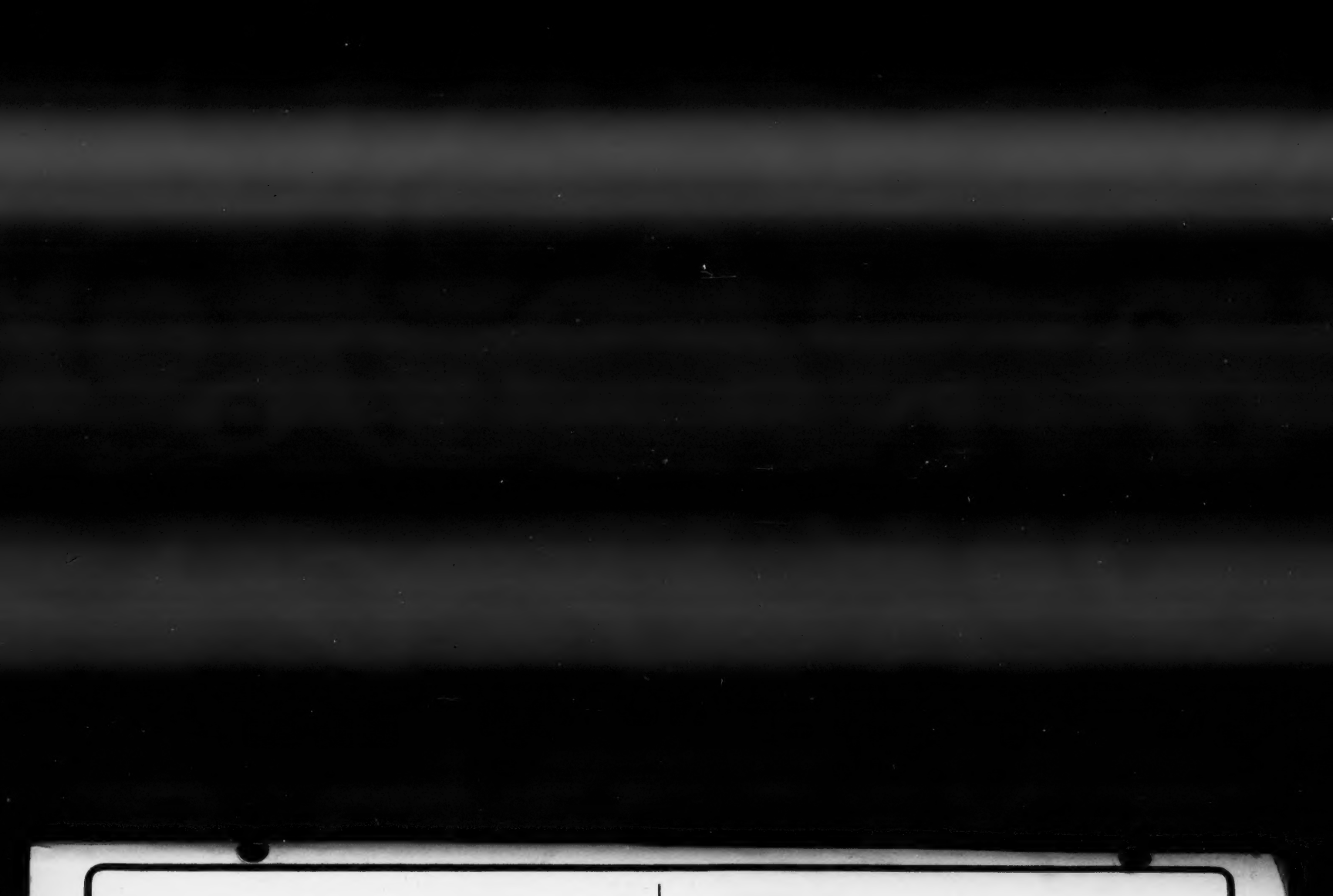
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